

Aviation Week & Space Technology

December 10, 1962

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SPECIAL REPORT:

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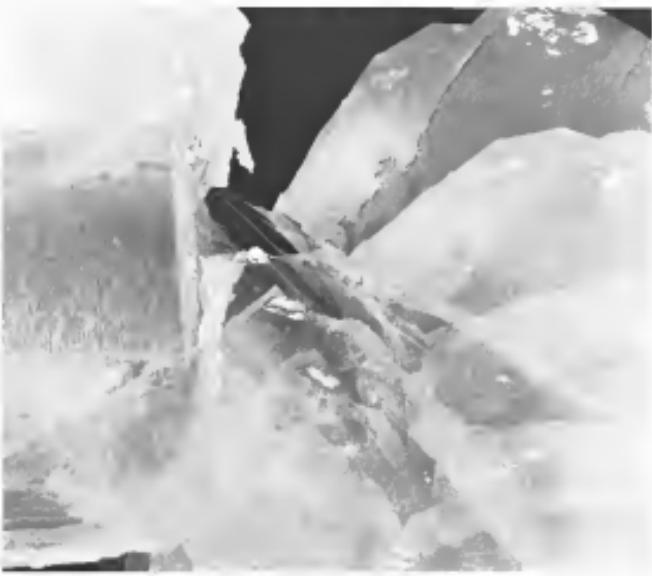
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AEROSPACE CALENDAR

Dec. 17-18—Fiftieth Annual Conference on the Utilization of Retired Military Personnel, Sheraton Park Hotel, Washington, D. C. (Government Department of Labor, American Legion.)

Dec. 17-18—International Arms Control Symposium, University of Michigan, Ann Arbor, Michigan. Co-sponsors: University of Michigan, Rand, Stevens Institute of Technology, and the American Association for Advancement of Science, Philadelphia, Pa.

Dec. 21—American Astronautical Society Symposium on Scientific Satellites-Manned and Unmanned, Franklin Hall, Philadelphia, Pa.

Jan. 7-10—Mid-Atlantic and Sub-Atlantic Conference, Institute of Radio Engineers, Cherry Creek Hotel, Orlando, Fla.

Jan. 13-14-15—15th Annual Convention, Hotel California, San Francisco, Calif.

Jan. 14-15—Automatic Engineering Congress and Exposition, Society of Automotive Engineers, Civic Hall, Detroit, Mich.

Jan. 14-15—Annual Meeting, American Association for the Advancement of Science, Statler Hotel, Los Angeles, Calif.

Jan. 21-22—11th Annual Meeting (including Wright Brothers Lecture), Institute of the Aerospace Sciences, Hotel Astor, New York, N. Y.

Jan. 21-26—11th Annual Meeting, American Meteorological Society, New York, N. Y.

Jan. 22-26—19th National Symposium on

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AVIATION WEEK and Space Technology



December 13, 1962

Publication, Please send your copy to: Published by:
Sage Publications, 2455 Teller Road, Thousand Oaks,
CA 91321, U.K.: Sage Publications Ltd, 6 Bonhill Street,
London EC2A 4JL, U.S.A.: Sage Publications, 2750 Oakwood Drive,
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Collect data: how to collect data without collecting mistakes

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TIME IN FRACTURATION: practical suggestions by Frode-Jørgensen and colleagues.

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to rotate this wing
through 90°



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fire-resistant
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to guarantee
safety

The tilting wing is one design approach to VTOL (vertical take-off and landing) capability. There are others, but one factor they all have in common is heavy reliance on hydraulic power for the transition from vertical to horizontal flight and back again.

Tilting engines, ducted fans, fire fans, overdrive flaps, thrust deflection, separate lift engines, or various combinations of these elements all involve unprecedented extensions of the hydraulic system. Because they are so extensive, the systems often must operate close to "hot spots."

That's the environmental situation. On the one hand: more tubes, more actuators, more connections where leaks could develop. On the other: proximity to heat sources.

Given those operating conditions, the specification almost writes itself: Fire-resistant Skydrol for the hydraulic systems of VTOL aircraft.



MONSANTO CHEMICAL COMPANY
Organic Chemicals Division, St. Louis 66, Mo.

AEROSPACE CALENDAR

[Continued from page 5]

Reliability and Quality Control, Sheraton Hotel, Hotel Plaza, Paris, Calif.

Jan. 25-26—Annual Army Aviation Computer Systems Symposium, International Inn, Washington, D. C. Sponsor: National Aerospace Computer Council.

Jan. 30-Feb. 1—Fiftieth Annual Solid Propellant Rocket Meeting, Conference American Rocket Society, Bellvue Sheraton Hotel and The Franklin Institute, Philadelphia.

Jan. 30-Feb. 1—National Winter Conference on Military Electronics, Institute of Radio Engineers, Anchorage Hotel, Anchorage, Alaska.

Feb. 1—Symposium on Engineering for Major Scientific Programs, Georgia Institute of Technology, Atlanta, Ga.

Feb. 3-7—Advanced in Manufacturing Seminar, American Society of Tool and Manufacturing Engineers, Park Sherman Hotel, New York, N. Y.

Feb. 6-7—10th Meeting National Aerospace Standards Committee of the Aerospace Industries Assn., Anchorage Hotel, Anchorage, Alaska.

Feb. 11-15—Third International Symposium on Dynamics of Space, UNESCO Building, Paris, France. Sponsored International Scientific Radio Union, Office of Naval Research, La Federation Nationale Des Industries Electroniques.

Feb. 11-13—Space Vehicle Thermal and Altitude Control System Symposium, conducted by the American Astronautics Division, Engineers Club Dayton, Ohio, Sponsored: ASD's Flight Aerospace Laboratory.

Feb. 15-April 18—International Aerospace and Space Fair Congress and Competition, Brussels, Belgium. Tel. 300-2000, Tel. 300-2001, Brussels, Belgium.

Feb. 16-22—1961 International Solid-State Circuits Conference, Philadelphia, Pa. Sponsored: Institute of Radio Engineers, American Institute of Electrical Engineers, University of Pennsylvania.

Mar. 1-2—Propulsion Meeting, Institute of Space Research, Princeton, N. J.

Mar. 11-15—Electro-Productron Conference, American Society of Testing Materials, Hotel Colorado Springs, Colo.

Mar. 15-20—Space Flight Testing Conference, American Society of Testing and Materials, Hotel Colorado Springs, Colo.

Mar. 16-21—1961 Women Metal Exposure and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

Mar. 17-21—Second Air Force sponsored Seminar, Hotel Biltmore, Phoenix, Ariz., Denver, Colo.

Mar. 18-23—International Government, Institute of Radio Engineers, Whistler Auditorium and Coliseum, New York, N. Y.

Apr. 1-4—Fourth Annual Structures and Materials Conference, American Society of Mechanical Engineers, Hotel Pennsylvania, New York, N. Y.

Apr. 2-3—Eight Annual Business Aircraft Safety Seminar, Flight Safety Foundation, Robert Moses Plaza, New York, N. Y.

Apr. 2-5—Space Conference, August Open and Closed, Fairmont Hotel, Washington, D. C.

[Continued on page 9]

quad klystrons which are providing megawatts of peak power for space radar systems, are part of the extensive line of Litton microwave tubes and display devices. San Carlos, California; In Europe, Box 100, Zurich 50, Switzerland

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ELECTRON TUBE DIVISION



PROBLEMATICAL RECREATIONS 148



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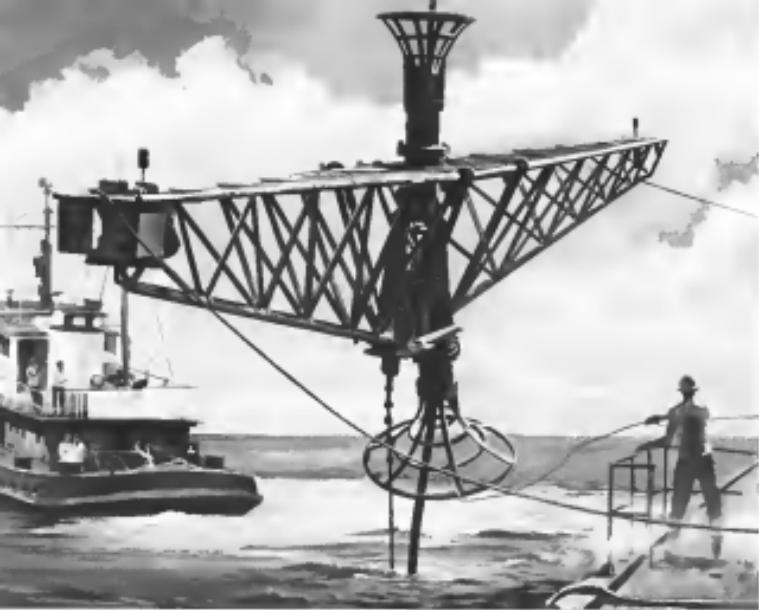
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ANSWER TO LAST WEEK'S PROBLEM: $5/17/08 \cdot 1122 = N_1 \cdot C$, $1122 = N_2 \cdot C$ so that C divides 1122 and 1185, and hence C divides the greatest common divisor of these numbers. The gcd is 17, a prime, so that $C = 17$ with $N_1 = 65$, $N_2 = 130$.

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Putting ears in the ocean

Unique underwater sound laboratory built by Lockheed helps U.S. Navy measure submarine noise.

The sea is saturated with sounds—the motion of the waves, the sounds of ships and the label of marine life. Getting out single sounds—such as the noise of a distant submarine—may be as difficult as hearing a pebble thrown into a pond during a thunderstorm.

Lockheed Electronics Company was chosen by the Navy as team manager to direct the design and installation of the first operational range of this vital program.

Innovative Designers of Lockheed integrated and developed a bottom-mounted sound array, involving the sensitive hydrophone system for the surveillance, detection and management of underwater sounds.

Practical Packages of Lockheed housed the system to operate efficiently under the extreme pressure and other adverse conditions encountered underwater.

Engineering Follow-through teams

of Lockheed directed the installation of the hydrophone array in deep water—seal completed, test and checks out of the system to assure optimum operation is that environment.

Lockheed offers these innovative designers, practical packagers and engineers follow-through capabilities to the defense and civilian electronic industries alike. LEC is the electronics gateway to several thousand mathematicians, engineers and technicians who work for Lockheed.

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LOCKHEED ELECTRONICS COMPANY
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AEROSPACE CALENDAR

[Continued from page 7]

Apr. 16-18—Fourth Symposium on Tagging, Institute of Mechanics, University of California, Berkeley
Apr. 18-20—Hydrogen Safety Council and American Rocket Society and American Society of Mechanical Engineers, Naval Ordnance Laboratory, White Oak, Md.
Apr. 19-20—International Nuclear Mag. Waves Conference, Whistler Hotel, Whistler, B.C.—Sprint, Canadian Institute of Electrical Engineers, IEEE
Apr. 19-20—Infrared Conference and Electron Show, Institute of Radio Engineers, Dallas Memorial Auditorium, Dallas, Tex.
Apr. 20-21—Technical Meeting, Nuclear Materials for Space Applications, American Metals Society, Metropolis Hilton Hotel, Chicago, Ill.
Apr. 21-22—Hydrogen Meeting, National Association of Engineers, Amer. Welding Soc., Washington, D. C.
Apr. 22-24—Second Nuclear Space Flight Symposium, Institute of the Aerospace Sciences in cooperation with NASA and AFSC, Dallas, Tex.
Apr. 23-24—Third Annual San Diego Regional Conference, Engineers, Ind. World's Headquarters, San Diego, Calif.
Apr. 24-26—Braunschweig Technical Conference, Institute of Radio Engineers, San Diego, Calif.
Apr. 26-May 3—Annual Conference, Society Photographic Research Engineers, Atlantic City, Atlantic City, N. J.
May 13-15—Annual National Forum, American Weather Society, Sheraton Park Hotel, Washington, D. C.
May 14—Aerospace Conference, Annual Rocket Society and Aerospace Med. of Am., Los Angeles, Calif.
May 23—Fourth National Symposium on Human Factors in Electronics, Institute of Radio Engineers, Marconi, Two Bridges Hotel, Washington, D. C.
May 24—Aerospace Research and Vibration Conference, Institute of the Aerospace Sciences, Washington, D. C.
May 29-June 1—Electronics Components Conference, Institute of Radio Engineers, Marconi, Two Bridges Hotel, Washington
May 18-19—National Annual Electronic Components, Institute of Radio Engineers, Denver, Colo.
May 19-21—Consistent Growth Forum's Second National Symposium on An Electrophysics, Herford, Conn.
May 20-22—National Symposium on Materials Theory and Techniques, Institute of Radio Engineers, Marconi Hotel, San Francisco, Calif.
May 20-22—National Telecommunications Conference, Hilton Hotel, Albuquerque, N. M.
May 21-23—Space Joint Computer Conference, American Federation of Informations Processing, Cambridge, Mass.
May 27-28—Second National Conference on Product Engineering & Production, Institute of Radio Engineers, Continental Hotel, Cambridge, Mass.
June 7-10—19th French International Air Show, Le Bourget, Paris, France

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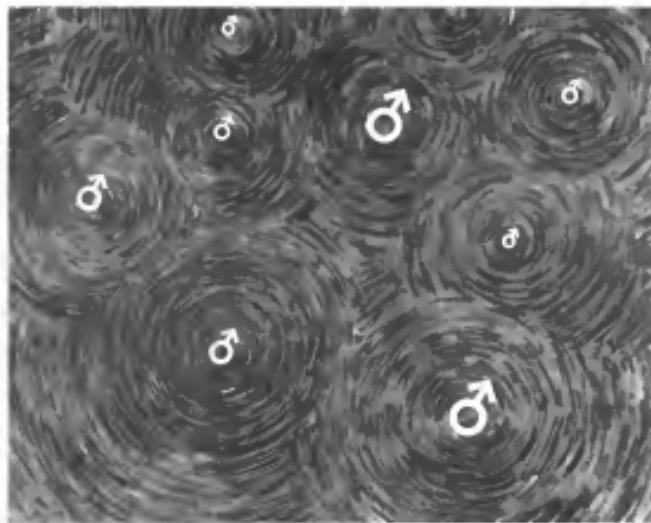
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Exploration of the universe by spacecraft capable of safely transporting men takes vast down-to-earth preparation. That's why Douglas is now building the nation's most modern research and development facility at a 245 acre site in Huntington Beach, California. □ The Douglas Space Systems Center will include a quiet vibration chamber 39 feet in diameter, capable of housing a complete manned spacecraft. Supplementing this will be a complex of specialized research laboratories.

MAN-RATED SPACECRAFT

...AND WHAT DOUGLAS IS DOING ABOUT THEM

Here, manned space systems will be proved in environments similar to those which will exist on orbital, lunar and interplanetary missions. □ Douglas' understanding of space problems is a direct result of booster experience and manned vehicle experience with high performance military aircraft.



The new Douglas Space Center will further assist of the more than 500 research programs now under way in company laboratories. And it will accommodate the sophisticated technological equipment required to solve the new problems man will meet.

DOUGLAS

also begins to explore outer space.



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For special-purpose, long-range communications, Fairchild Stratos-ESD has created and developed Helewater. An electric-powered rotary wing tethered drone, it can hover as high as 8,000 feet, stay aloft 1,000 hours without maintenance. The latter itself serves as the antenna for VLF and LF transmission. Helewater can act as a sensor platform for difficult

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EARTHBORNE INSTRUMENTATION

Precise target tracking and tracking need precision instrumentation. Sperry has the capability and experience in instrumentation to meet the need.

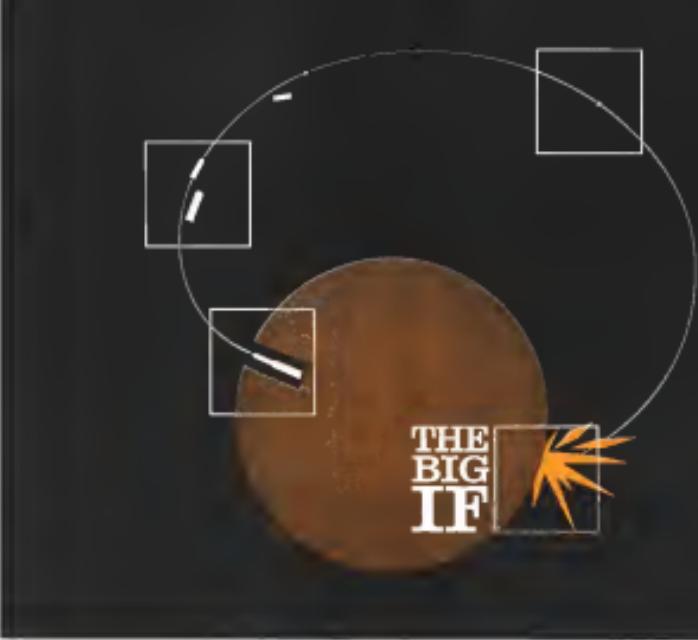
Sperry has system responsibility for the ARIS (Advanced Range Instrumentation Ship) program — seagoing tracking stations to collect accurate terminal trajectory and reentry data — a project incorporating every advanced technique in data handling, radar, table rating, navigation and associated technologies. In space vehicle tracking, Sperry has the best background going — with missile and associated interface experience from the missileable (MPS-4) to the mighty (MPS-35) — plus creative capability in orbit control, both analog and digital, weapon direction equipment (Tele WDE) and other areas.

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The Para-Visual Director (P.V.D.) conveys and presents to the pilot, in entirely new way, information previously available only in his instrument panel. It consists of small 'beams' which circle when the aircraft banks, turns or goes... these are readily caught even out of the corner of the eye. The pilot thus receives continuous information about the aircraft's position relative to the runway, its approach angle, and the rate of descent. The P.V.D. is currently being evaluated by A.F.M. and other air force and aerospace firms part of the company's unique Flight Control Systems installed in the B.F.A. and Mosquito Trainers, the first commercial aircraft to be specifically designed for all-weather flying.

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From Johns-Manville, manufacturer of Min-K and Thermolite, the most thermal insulation used aboard the Mercury and Gemini space capsules, are two important products—J-M Microbestos Paper and J-M Micro-Quartz Fiber. They are designed to provide reinforcement for high-temperature plastics such as carbon fiber, glass fiber and aerodynamically heated surfaces.

Microbestos Paper is a high-purity, nonfibrous, reinforcing paper made of asbestos or asbestos in combination with other organic and inorganic fibers and fibers. It is capable of withstanding up to 50% strain extension. Micro-Quartz reinforced products saturated with various resin systems are available from leading manufacturers of laminating sheets, tapes, and welding compounds.

Micro-Quartz is made of the highest purity silica fiber with the thermo-physical properties similar to those of pure silica. It is available in bulk form or various fiber diameters to serve as a reinforcement for high-temperature and insulation plastics.

For full details on these and other J-M aerospace insulation, write to: J. B. Jobe, Vice President, Johns-Manville, Box 14, New York 14, N. Y. In Canada: Post Credit, Duncan, Cable: Johnsman.

JOHNS-MANVILLE

Aviation Week & Space Technology

December 18, 1982

Volume 77
Number 34

Ford Instrument Does It With Digits:

Symbolized above is Ford Instrument's present configuration of the "strap-down" inertial guidance or navigation system. The "strap down" concept replaces the stable platform; gyro's are mounted directly to the vehicle frame and the platform functions are performed by a digital computer.

Developed by Ford Instrument, this system offers unprecedented space and weight savings together with flexibility in its placement of components and adaptability to minor design changes.

The "strap-down" program was initiated as an ABO study at Wright-Patterson Air Force Base. The "strap down" concept has been proven sound through an extensive flight test program.

Innovations such as this are evidence of Ford Instrument's well-honed capability for rapid and successful accomplishment of research and development assignments. Creativity tempered by practical experience, technical talents effectively directed by a dynamic management team.

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POSITIONS
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Volume 77
Number 34

WILLIAMS BROWN

Supersonic Transport Stakes

B.F.Goodrich
aerospace and
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BFG tire laboratory roars down the runway

At a deserted airport in Florida, this odd-looking vehicle helps B.F.Goodrich engineers design better tires for jet service.

The single tire at the rear of the vehicle carries a load of 36,000 pounds — equal to load per tire on a big jet. The vehicle speeds down a runway through an area of controlled debris consisting of nuts, bolts and broken concrete which can cause damage. Objective of this test program is to test wear, cut resistance and other dynamic conditions, and evaluate new designs.

This is the first vehicle ever made to test aircraft tires under actual airport conditions. Through research of this type is one of the reasons B.F.Goodrich is leader in aircraft tires — and has pioneered with胎侧-tread tires, new designs, and new materials. Speedy BFG jet tires you can depend upon. *The B.F.Goodrich Company, Aerospace and Defense Products Division, Dept. AW-12, Akron, Ohio.*



Examination of debris-laden tire test vehicle data on landing strips, sand and rolling runway in different types of aircraft.

Final approval of the Anglo-French supersonic transport program (AW Dec. 3, p. 41) came as a surprise to many people in this country who regarded this month's publication effort as a paper program that would never develop into a flying machine. We changed our mind about the solidity of that program either in the fall after flying in many of the technical people involved on the British side of the program. It was obvious then (AW Sept. 17, p. 34) that a great deal of substantial wind tunnel and engine development work had already been completed on both sides of the Channel and the technical management involved in both countries were engaged much more heavily than any paper presentation studies would warrant.

Thus the formal signing of the Anglo-French agreement last month to jointly finance building two prototypes and two preproduction models of the Mach 2.2 Concorde transport serves as ample warning that this effort represents serious competition in the race to sell this type of transport in the international airline market. They are tackling a goal well within the technical capability of the team since the Concorde 2.0 has demonstrated Mach 2 cruise performance as a standard operating procedure. Aerodynamics and engine development will require an broad state-of-the-art advance to bring the Concorde into airline service, although this will represent a design and production achievement requiring the top talent of both countries. Despite all of the anguished walls of aircraft producers in Doha, and the stern admonitions of IATA's Director General Sir William Hilditch, there is no doubt that a supersonic transport will be readily available in the international airline market. Every major technical advance in the world has had Sir William wringing his hands during its gestation period. The history of technology has shown that despite these wailing, program continues its inevitable march forward.

Definite Market Value

We think that a transport that can cut present travel time between major stage length around the world in half will have a definite market value. Once its performance has been demonstrated during initial flight testing, passengers will be eager to buy a ticket to utilize its speed. The price that would success in the supersonic transport race is a large enough slice of the international airline market to make this a profitable venture.

The fact that the Anglo-French Concorde is off to a solid start with a technically sound plus, however, does not yet insure that success. Experience has shown what a vast difference there can be between being first into

the market with a new technical development and arriving later with a much sounder product. The British originally pioneered postwar jet transport development with the Comet 1. They were the first to put a jet transport into airline service with BOAC's London-Johannesburg route in 1952. The Soviet Union was the second nation to put jet transports into airline service with its Tu-104 (stagecoach) in April of 1956.

The first Boeing 707 jet transports were not delivered to customers until late in 1958 and were not really seen on the airways in any significant numbers until the next year. Yet today the Boeing 707 is the most widely used jet transport in airline service around the world. Boeing has cut the largest slice of the transatlantic jet transport pie selling more than 475 planes of this basic design. In contrast, the Comet 1s operating today number less than 100 and the Soviets have failed to sell the Tu-104 in a competitive market despite strenuous efforts to do so.

So it is not just user groups when U.S. manufacturers view their purpose is not to be put first in the supersonic transport race but to be "first with the best." This is a policy that has paid ample dividends in the past.

Soviet Competition

The Anglo-French Concorde has a chance to be both first and best in the supersonic field. Its initial competition to be the first will probably come from the USSR where a supersonic transport is in the works, although little is known about its design goals or development program. The lack of Soviet success in selling its transports in the non-military airline market has been due to basic defects in the Soviet planes on profitability and competitive economy, rather than any lack of technical talent in its aircraft industry. We doubt that their supersonic transport will be any more successful than their turboprops and turboprops once the system that produces them has not corrected its flaws.

Real competition for the Concorde is to be the best will come from this country if and when a firm decision is made to begin supersonic transport development. The government has been supporting a modest research and development program in this area and at least four major aerospace manufacturers have been devoting considerable technical resources to exploring this area. But as yet there has been no firm decision on either the direction the U.S. supersonic transport program should take or the pace at which it should move. Hopefully both of these decisions will be made as part of the Fiscal 1961 federal budgeting process that should come to fruition next January.

—Robert Holt



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WHO'S WHERE

In the Front Office

Pete & Whitney Aircraft Division of United Aircraft Corp. has named Paul C. Goss to succeed the following as president: Arthur E. Smith, executive vice president; Bernard A. Schlossberg, vice president-comptroller; James S. Lee, vice president-financial; Bert J. McNamara, vice president-purchasing; Bernard J. Goss, executive director-Fluids Research and Development Center; Walter Dell, general manager-CANEL (Connecticut Advanced Nuclear Engineering Laboratory); Louis Paskaris, general manager and vice president-UNIC (United Nuclear Industrial Components); and Edward J. Deacon, general manager-Divisional Sales. Walter Deacon, Goss' vice president; Charles T. Borke, executive vice president; Ernest Corvera, assistant to the division president; John F. Bonsuji, vice president-marketing; Donald G. Kline, vice president-operations; and John T. Treadwell, vice president-Aerospace. General manager-purchased support equipment department and general manager-industrial products department: Walter Bush, general manager-electronics department; John F. Salter, general manager-manufacturing and repair department; UNIC, New Haven, Norwalk, Conn., has appointed Ernest J. Gersbach, vice president operations; Will M. Quinn, Jr., vice president engineering; Francis P. Hales, vice president sales and service; Mike L. Vassallo, vice president sales.

James M. Hartman, vice president manufacturing, Icarus Astronautical Co., San Diego, Calif.

George W. Dink, executive vice president, CECIR, Inc., Washington, D.C.

Adm. William Frederick Bourne (USN, ret.) has been appointed executive director for Defense Support, a newly established division of the National Aerospace and Space Administration.

Major J. Ronald McDonald of London, England, has been appointed to the staff of the joint U.S.-U.K. Committee on Space, the international Air Transport Area, to publicize the results of the research of the internal load control traffic conference.

Honors and Elections

William M. Allen, president of The Boeing Co., has been elected chairman of the Board of Governors of the Aerospace Industries Assn. for 1965. Donald W. Douglass, Jr., president of Douglas Aircraft Co., was elected vice chairman. Billie C. Burch, chairman of the Board of Governors, Precision Castparts Corp.; James E. Morris, chairman of North American Aviation; Malvina F. Ferguson, president of The Boeing Corp.; Carl G. Johnson, chairman of the board of the Goodyear Tire & Rubber Co.; Dan A. Kuehnl, president of Aerospace General Corp.; E. Clinton Todd, president of Convair-Aerospace Engineering Corp., and the press agent of AIA, were inducted.

Dr. Hugh L. Dryden, Director, Advanced Research Projects Agency, Defense Science Board, and Chairman of the Defense Science Board, has received a 1962 Federal Blue Ribbon Service Award in the field of science, technology and engineering. (Continued on page 113)

INDUSTRY OBSERVER

►Ping-Pong is the name for a small, potentially recuperative reentry vehicle and reentry rocket being developed by Lockheed Martin & Space Co. as an alternative to Army Signal Corps' philosophy of an objective low-altitude counter-satellite system. Ping-Pong would replace the more expensive and recently terminated USD 5 cancellation defense program (AW Nov. 26, p. 35). Ping-Pong's vehicle would have a system at both ends enabling it to refuel for a return to friendly territory.

►Watch for British Parliamentary peace talks to resume for heavy liaison of the Ministry of Aviation chief sermons onto private industry. In just 10 years, more than 600 examples of departmental rank or above have left the Ministry. Opposition Labor Party wants legislation aimed at restricting top-ranking civil servants from entering private industry for two years after leaving government posts.

►Difficulty in solving the problem of the sonic boom in supersonic transport operations has directed serious attention to the low supersonic speed range as a possible alternative. Several manufacturers are studying the characteristics of a transport designed to operate at about Mach 1.2 as one way of avoiding the sonic boom intensities expected at higher speeds. One problem area will be in dealing with the cause Mach number lies within the transonic region where flow characteristics make prediction of sonic boom difficult.

►Air Force Space Systems Division is building sources with power ability to design and build pulsed plasma engines to be tested in ballistic rocket flights.

►Avionics companies are expected to submit bids by Jan. 7 for Air Force's space communications and tracking subsystems and flight test program (NW Sept. 10, p. 36), expected to lead ultimately to a complex for commanding and controlling all types of Air Force earth-orbiting satellites. Bidders probably will include General Dynamics/Astronautics, Convair Electric, Hughes Aircraft, Philco, Radio Corp. of America and Space Technology Laboratories.

►Starg-MA, nuclear reactor and thermoelectric power conversion system designed to produce 700 watts, is scheduled to be flight-tested late next year. Vehicle will be an Air Force Agent B, trials will be conducted under a program previously known as Stargate. North American Aviation's Aerospace Division is managing Starg-MA under contract with the Atomic Energy Commission. Lockheed Martin & Space Co., which will integrate the system with Agent B, is managing the greatest emphasis to requirements for radiation resistance of atomic equipment in the instrument (AW Oct. 8, p. 35).

►Convair-Aerospace Engineering Corp. is proposing its W7F Hawkeye to the Air Force as an airborne warning and control and control aircraft. Convair earlier proposed a carrier-based version of the W7F to the Navy, in carry 25 passengers or 39 troops over a 1,400-nautical-mile range.

►Strategic Air Command KC-135 tankers will be delivered without the usual emergency point startings on vertical tail and fuselage nose. Studies have concluded that the point does not contribute significantly to the safety of night refueling operations.

►Boeing Co.'s Wichita, Kan., facility is modifying a B-52 to be another plane and launcher for initial flight-test of the Divas-Sat. An Air Force glide vehicle will be used for secondary stability tests and pilot checkout. Launch from the B-52 below being boosted into space with the T-200 (Star 2/2A) launcher. Modification of the B-52 may be completed by April, 1963.

►Aeros Control and Dissemination Agency plans two new research study programs, one dealing with response to violations of agreement and the other covering the role of ground-inspection tests in detecting unauthorised munition production activities. Industry proposals on the first are due Jan. 3, on the second, by Jan. 15.



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Washington Roundup

Ranger Review Ends

Report on the findings of NASA's in-house review of the Ranger lunar spacecraft program (AW Oct. 29, p. 38) was completed Dec. 7, and although it is somewhat critical of Jet Propulsion Laboratory's management of the project, it concludes entirely that JPL's Ranger should continue, and under JPL's direction. JPL probably will have a chance for rebuttals before details of the report are given to Congress or made public. NASA's new man-based subsystems and spent a week at JPL during its five-week study.

JPL's long-run result of all this will be a clear, written definition of the division of responsibilities between itself and NASA headquarters, which it feels has been lacking.

Federal Aviation Agency is debating whether to propose legislation spelling out its authority in helping to reduce aircraft noise. Some FAA officials argue that would be better than letting Congress define this authority for the agency. Several bills aimed at giving FAA anti-noise responsibility failed to pass in the last Congress.

A2F-1 Cost Under Fire

Cost vs. effectiveness argument is threatening to cut short the Navy's Carrier A2F-1 attack aircraft program in fiscal 1964 budget-making efforts in its final stages. Navy is reinforced by Congress to lay a total of 65 with Fiscal 1967 and fiscal 1968 money. It considers the A2F-1, which combines strike, electronic and target-suppression roles on a display to possess all weather attack, a highly sophisticated aircraft. Total cost and price will be \$2.75 million in fiscal 1968. This has now dropped to \$8.51 million, but analysts in the House Armed Services Committee say it could be as low as \$2.4 billion.

An House Select Committee on Legislative Initiatives is being attacked both on anti-noise effectiveness (AW Nov. 26, p. 27) and on the argument that the first strike aircraft, capability will soon pass to intercontinental ballistic missiles. The argument runs that the A2F-1 could also serve as a nuclear support aircraft—which is one of the rationales of the Skyhawk—and allow B-52 aircraft to fly to their targets with nuclear bombs loaded. An House committee that Skyhawk provides a much more flexible response than a ground-based ballistic missile.

Lower echelon in the Air Force are serving a proposal to strip two Thud segments in a Douglas Thud to provide a relatively cheap booster for such payloads as the Space Shuttle reusable satellite. The booster would be called Thud.

Federal Labor Policy

Important policy question has been posed on whether the special labor committee appointed by President Kennedy to enduce work stoppages during construction of operational military missile launching sites should extend its jurisdiction to several weapons and National Laboratories and Space Administration installations of the National Defense Dept. John P. Edwards, executive director of the President's Missile Site Labor Committee and Defense Dept. has asked the committee to help make labor-management harmonies at government-owned sites and NASA has asked similar help at space centers in Huntsville, Ala., and Michoud, La. The commission, chaired by labor Secretary W. Willard White, was deadlocked on the question as of Jan. 17, 1964.

Basic issue is whether expansion of the commission's role would lead the government deeper into labor-management relations before a need is demonstrated. What is more, debtors that has predecessor, Arthur Goldberg, and now must re-lodge the commission's jurisdiction at this rate.

Max Goldberg, an FCC general counsel, will leave the Commission around the end of the year after 14 years as USF's associate general counsel, despite the assistant procedure for external and legal offices. Goldberg told AVIATION WEEK & SPACE TECHNOLOGY that he is leaving for financial reasons, and has not yet decided whether he will practice law or take an appropriate industry post.

Canaveral Helicopters

Use of helicopters to cut forest trees in the Cape Canaveral area is under study by NASA. Sixteen C-5 and NASA-owned and leased trees are 20 to 35 m. in diameter at Petree AFM, Fla., and Cocoa Beach. Helicopters also could be used to land personnel from an aerial platform at Orlando and Melbourne. NASA would buy the helicopters. NASA would be provided under contract, if NASA decides the service is necessary, within the 1964.

Latest anti-ballistic missile comes from Paul H. Nitze, assistant secretary of defense for international security affairs, in testimony released recently by the Senate Foreign Relations Subcommittee. He said "an effective anti-ballistic defense" would "...in the end fit into [NASA's] role for us with present feasible technology." Delivery systems and related electronics, rather than further development of nuclear explosives, will peer development of anti-BMDs, he said.

—Washington Staff

Urgent COIN Aircraft Program Planned

Bids will be asked by Jan. 1; \$100,000 glass-fiber counter-insurgency vehicle would have turboprop.

By Larry Sodus

Washington—Industry will be asked before the end of the year for proposals to develop and produce as a "canal" have a relatively small, glass-fiber counter-insurgency (COIN) aircraft. It would be used in the U.S. but would be strategic primarily for small nation-based counter-insurgency attacks.

Target cost of the aircraft in quantity production has been set at \$100,000 each. No final decision has been made on which version will be given management responsibility, but it appears that it will be given to the Navy.

Specifications will require that the aircraft be powered by two turboprops in gross of about 1,200 hp each, able to operate from a 500-ft strip over a 50-ft H-rail. The aircraft will be capable of operating from the water. It will have a crew of two. Target weight is 3,500 lb engine and wing span is 20 ft.

Target maximum speed is 40 kt with power on and 60 kt with power off. Maximum speed during a burst is 250 kt and 380 kt.

Reasons for the choice of wings is the need to replace the relatively low performance aircraft now being used in guerrilla actions in this area, not over the next two years. No assault team, no production is considered capable of fulfilling the counter-insurgency role.

The specifications call for a greatly developed cockpit. The only requirement will be a statement that it is desired that the basic construction of the aircraft exterior be glass fiber to produce a minimum radio return.

Another requirement limits the armament and target location equipment to ruggedized and low-light-level television.

Night Actions

It is estimated that 90% of all guerrilla actions take place at night. During daylight the targets that are vulnerable are easy to see and wait for darkness to start.

In this kind of counter-insurgency warfare, the aircraft do not prevent enough attacks. The standard mission would involve going to the front line area, landing as a stop to pick up an observer equipped with the area, proceeding to the action area and wading an attack at low level. Since the average terrain is Southeast Asia, where the aircraft probably would be used first, it will be in mountains, VHF or UHF navigation equipment cannot be used and the aircraft may be forced to land at night.

The specifications will call for a low frequency radio which will be reflected from the atmosphere, covering an area of about 10 miles. In some respects it would resemble the British-developed Deneb

lb of arms, proceed 50 mi to the combat area, pick up an observer, then return to the stop 30 mi before returning. Other missions would be evaluations of cities, collecting data for weather teams or enhancing the combat radius. A Defense Dept. official emphasized that no technical breakthroughs will be necessary to develop the aircraft. No major consideration in writing the specification was given to ease of maintenance. Glass fiber is easier to repair than metal. Electronic equipment could be replaced easily in the field and later repaired at central locations.

There are about 3,000 of the "T" and "L"-bar targets and human-light aircraft in use outside the U.S. today. Most are 15 to 20 years old.

A team of U.S. experts, Americans and Asians, has been working on a contract which are now engaged in military action against enemy guerrillas are not used for training or maintenance purposes but for actual operations. These have been augmented in Southeast Asia by an estimated 800 modified North American T-28 aircraft from the storage inventories of the Air Force and Navy. There already are more NASA T-28 (SNJ) aircraft in use in Southeast Asia.

When the situation in Southeast Asia gave to such proportion that the supply of relatively new aircraft was not available, the experts now are trying to replace them. A series of studies revealed that all assembly lines for aircraft that would even partially fulfill the requirements had been closed down long ago. The repair requirement was generated 16 months ago.

Morris Corp. Studies

Because the specifications that will appear in the requests for proposals will be an enlargement of studies conducted by the Morris Corp. over a number of years, the team is looking for a short time to develop and produce the aircraft. Present thinking is to develop a short takeoff and landing fighter using these ideas now established in the Navy during World War 2. By 1948, the Convair Vought XF5U had been built and was flown. The concept was considered good but the aircraft lacked sufficient power from its two Pratt & Whitney R-2800 reciprocating engines for successful operation.

The requirement for the new counter-insurgency aircraft do not call for the capability of making emergency takeoffs or arrested landings. Nevertheless, it will be able to operate from terrain because of its minimum speed capability and high power-to-weight ratio.

Review of Morris' Specification Standards has been recommended in order to speed the program. In a logical high-priority merit, rated application of these standards is considered necessary. With some production having been started recently, it has been decided that the requirements can be eased without resulting in an unsafe or unsatisfactory aircraft.

system. This would enable the pilot to designate the general area of target. To judge the target, the aircraft will have to be used. It is at this point that the observer from the front line would be helpful. Two lighted TV systems have been developed by the Defense Dept. Glass adaptations of such a system in the counter-insurgency aircraft application should be necessary.

Accommodation of the aircraft will not include any highly sophisticated armament such as bombers, linear control through steering or banking on the wings, because it is difficult for relatively unsophisticated military forces of smaller nations to maintain such equipment. It will be designed to be simple and rugged.

The lowest cost would be attained by having the aircraft built by contractors to contract manufacturing proposals. When lightly loaded, the aircraft would have almost vertical takeoff and landing capabilities.

In one suggested configuration the aircraft could resemble significantly the Lockheed P-38 fighter of World War 2. It would have twin booms with a fuselage between. The water operation adaptation would mean some minor modification to the underside of the aircraft to allow for water takeoffs and landings.

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On a hybrid mission, the aircraft would have to take off carrying 1,500

Advanced Missile Re-entry Flight Tests Planned

Capo Circeo—All phases of advanced ballistic missile tests will be completed by the end of the year. Countermeasures will be evaluated, as well as the use of various materials to reduce weight. The Air Force program is designed to increase penetration effectiveness of U.S. strategic missiles and the knowledge is being applied.

Total of 13 contractors, including Aeravionics, Am. Bionics, Chryslers, General Dynamics, General Electric and Hughes, will participate in program, except AERES (the advanced ballistic missile system). Project code name has been changed from Rambler to Sleight of Confidence's effort still runs.

■ New materials with higher performance and lower cost than aluminum. Abilities materials, including some of the newer plastics and foamed metals and reduced computational, probably will reduce cost of materials.

■ Maneuverable reentry with the ability to change targets during descent so as to increase penetration effectiveness of "foiler" vector in order to obtain an intermediate range. The ability to maneuver during reentry would be an essential part of penetrative range.

■ Decay and other penetrative cells such as an inverse power to reverse with breaking of the nose by an anti-cavity radar. Although the primary purpose of the AERES program is the development of more effective offensive strategy, related flight test are expected to produce considerable data on each country's intercontinental, missile defense posture, space war characteristics, etc., that will be useful in designing U.S. space missile systems.

Plans to follow in this program will be completed by next spring, rather than modifications of presently operational Minuteman. The flight test will be conducted in June. Countermeasures, Fla., and Vandenberg AFB, Calif., should accomplish flight tests over the next three years. The Air Force program is designed to increase penetration effectiveness of U.S. strategic missiles and the knowledge is being applied.

In addition to the AERES tests, each launch vehicle will have at least one and possibly several parallel tests both on the side of its airborne. Scientific experiments for these will be provided by USAF centers and other government agencies such as the National Aeronautics and Space Administration or the Atomic Energy Commission.

Between 20 and 30 General Dynamics' ballistic missiles will be used by AERES team. Most will be from the former Minuteman Missile Range. First flight is reported late next month. Although the Air Force was scheduled to finish its Countermeasures and development flight test program late last week (see p. 17), the first several AERES missiles will carry the normal amount of missile instrumentation, since there was no production line before the decision to end the flight test program. All Air Force tests will launch these vehicles.

AERES is a more extensive continuation of missile research that began several years ago with the Lockheed/Lockheed/NASA rocket (AW Feb. 4, 1957, p. 27). Advanced strategic materials and techniques have been explored in earlier ICBM flights but always on a secondary basis.

Administration to Ask \$6 Billion for NASA

By Edward H. Koloski

Washington—Kennedy Administration plans to submit a \$6-billion fiscal 1964 budget for the National Aeronautics and Space Administration, with 71% of the money intended for manned space flight. The fiscal 1963 NASA appropriation was \$3.7 billion.

Congress is expected to cut more of the coming NASA budget than that of last year, but recent, less-Administration-led moves are breaking heavily on congressional support for a "moon" program which is designed to allow the agency to return to the moon by 1969.

That total will cost \$1.4 billion in fiscal 1964. It consists of development program costs intended to cover the 1965-66 launch-based leading target date.

These are Apollo Gemini, Skylon, T-3, and their associated flight and ground systems.

Last week, President Kennedy still had under consideration a \$425-million supplemental budget request for the space agency, despite NASA Administrator James E. Webb's public statement that a supplemental request will not be made (AW Nov. 19, p. 26). Chances are considered that, however, such a request will go through because both Administration and congressional delegations agree that the

agency needs the funds now, and not next March or April when Congress would probably review them. As a result, the fiscal 1964 budget request has grown from \$3.5 billion to \$6 billion in order to alleviate further delays in the manned space flight program.

The 1963 target date for a lunar landing is being approved for the next program. NASA recently conducted a schedule review and calculated that with an additional \$600 million for Apollo, the date could be advanced by five months to December 1967. But that gain is at the expense of such other programs as the space station which was removed and could be lost by the end of the 1963 spending year in June.

Budget Bureau and NASA are currently negotiating the fiscal 1964 space budget, and are in what is called the revenue phase. This means that NASA is preparing its arguments to retain \$200 million which has been cut from the initial NASA request of \$6.2 billion. Whatever programs are cut, however, it is generally conceded that manned space flight will not be among them.

During a discussion on the budget involving the President, Webb and Brianza Holmes, assistant space flight director, President Kennedy agreed with Brianza that his program has the highest priority in NASA.

Vice President Johnson, Webb, Holmes, Associate NASA Administrator Robert C. Seamans, Jr., and Dr. Edward C. Webb, assistant director of the Space Council, have been in fairly contentious discussions as policy-level questions regarding the coming budget request and its effect on future programs.

Questions under discussion by this group and the Budget Bureau concern programs other than manned space flight. Among them are nuclear reactors and reusable space power. A fundamental issue which has been raised is whether the reusable is whether a U.S. will proceed commercially with nuclear hardware and technologies or is it development of technologies before going into an active hardware program.

Other classified questions which could affect the fiscal 1964 program are the amount of duplication of NASA and Defense Dept. development effort in communications satellites and whether the large communications program can be delayed without affecting the end date schedule for Apollo.

Because such projects as Ranger and Survey are expected to contribute directly to Apollo, the Administration considers that funding for a part of these development and flight is a priority of the 70% of the manned space flight budget. Projects like these represent

the difference between the \$3.4 billion cost program and \$4.18 billion, which is 75% of the budget deficit. The cost program will permit NASA contractor to use maximum overtime, complete building of testpads and tooling for the Apollo program and shift into a pace considered just short of a "breath" program.

The funding problems NASA has experienced since the moon landing program was delayed in late summer forced the agency to mature what amounts to a slowdown among the prime spacecraft and vehicle contractors (AW Nov. 26, p. 26). The most effect of the slow down has been on Apollo which is short by \$100 million, but the most immediate effect is on the two-man Gemini mission schedule and concept.

Dr. Joseph P. Shea, deputy manager space flight director, has outlined the agency's view that a few months could be required in the Gemini program to characterize the agency's needs and the most benefit is to do nothing at all. He will be a "very high-priority" item.

And NASA hopes to make a decision this week on whether to stick with the original concept—refinements of Gemini with an Agena D stage (AW July 2, p. 94)—or to have the improved spacecraft rendezvous with a package of scientific equipment carried along on the same launch. Another alternative is to launch a light, inflatable sphere with the Thor Delta vehicle, which has put 13 scientific satellites into previous orbits after a single failure on the first attempt.

Dr. Shea says there is a 40-50 chance that the original concept will be changed.

An Air Force spokesman says he will submit a statement in developing the plan for Blue Gemini with NASA until the question of the concept. Air Force wants to buy into the program (AW Oct. 25, p. 32), and both USAF and NASA say it is likely close agreement that Gemini/Blue Gemini should be a cooperative program in the short run.

• Development costs funded by NASA
• First flight by NASA pilot, with USAF flight replays on one or more of the early flights. USAF would participate in mission operations and mission control centers.

• USAF to buy the final four or five of NASA's original order of 12 Gemini spacecraft, with NASA being capable of some of them.

• USAF to buy additional Gemini spacecraft. One of the reasons for Gemini is a growing support in the Air Force for an uncrewed testbed in the orbital interplanetary (Space) program (AW p. 36). Last week, Air Force had not received implied DOD approval to include this Gemini spacecraft in its fiscal 1968 budget.

• NASA to make some spacecraft if Gemini is selected as a space station

Money for early space station development work is included in the fiscal 1968 request, but configuration for the station might well be work done earlier than the 19, 21 and 36 months previously proposed by NASA (AW Nov. 26, p. 26; Sept. 1, p. 26; Nov. 12, p. 40). Agency is now thinking in terms of a 3 to 6 year station which could be developed and launched before the culmination of the Apollo program.

Lifeguards System

The space program that provides money to start work on a basic lifeguards system. Decision on whether the Apollo system should be made a part of Project Apollo is expected next month. Project Apollo program provides only modest funding for the system, but that could be changed if the agency feels it is necessary for the success of Apollo.

With funds and time now guaranteed, the agency's budget for 1968 is 75% of the budget the agency has NASA program officials would share about \$1.6 billion, including construction and in-house work and construction.

Fiscal 1967 budget was split that remained flight 42%, space science 16%, advanced research and technology, 14%; tracking, 5%; and applications, 15%. All Ranger and Surveyor systems now in the 1963 breakdown are included in space sciences.

Mariner 2 Expected To Complete Mission

Padova—Mariner 2, the Venus-based spacecraft launched from Cape Canaveral Aug. 22, is expected to complete its mission by the end of the year after a 14-month heating of the spacecraft's earth return.

Project engineers at the Jet Propulsion Laboratory in Pasadena said the temperature of the earth return reached 145° on Dec. 4, 13 days ahead of the original 150°. However, completion of the dry run of the survival of the earth return with the survival in the winter solstice's temperature indicates that it will be possible to shorten that by a month.

The engineers will add with a design review and a letter review to initial

DOD Plans Common Missile Designations

Washington—Directive ordering common designations and names for all military nuclear and guided missiles is expected to be approved this week by the Defense Dept.

The directive would use the same purpose for military rockets and missiles that the Defense Dept. directive of July 6, 1962, does for military aircraft (AW June 1, p. 26; Aug. 17, p. 27). Space vehicles and their boosters will not be included, since their designations are classified as sensitive.

Classification of a common designation is left to the Air Force, Navy and Army to take to two to three months after issuance of the directive. The list will then change from the one used for strength because relatives and societies have appeared in more designs and series.

As proposed, the directive defines the different types of missiles, such as anti-air, anti-surface, surface-to-surface, surface-to-air and anti-surface.

Designations for specific missiles and rockets will follow a letter-number letter sequence similar to aircraft.

They will avoid the event where all the rockets in a nation's fleet in the stratosphere could be confused with the same missile type. These designations are easily as they appear in aircraft as names. Next is a broad component symbol to indicate how it is launched.

Missile symbols include decoy, special electronic, surface attack, orbital insertion, hunting, underwater attack, weather, ground vehicle-type rockets and guided missile probe, robot.

The designations will end with a design number and a letter series to avoid

Judge Orders Umbaugh Reorganization Plan

Federal judge has appointed a trustee for Lockheed Aircraft Corp. and ordered him to select a list of creditors by Feb. 10 and a plan of reorganization for the company by Feb. 25.

Action by the Federal District Court for the Middle District of Florida, in Tampa, was in control of the company from its founder and president, Raymond E. Umbaugh.

Prize-Rain Manufacturing Corp. agreed to produce Umbaugh U-38 geosynchronous relay from Lockheed's Air Craft (AW May 28, p. 14), and has been awarded a \$1.5 million contract for the relay.

Production of aircraft at the company's Clewiston, Fla., factory was halted in the fall after less than one-half of a \$400,000 judgment against the company from a Baltimore, Md., court.

U.S. Still Pressing for Settlement Of Long Lockheed-IAM Dispute

By Katherine Johnson

Intel does not protect military rights and interests as a "sovereign" with 40,000 stations. Now it appears the plants and missile test installations of two divisions—Lockheed California Co. and Lockheed Missiles and Space Co.

Strikes voluntarily returned to their jobs at the personal request of William S. Simkin, director of the Federal Mediation and Conciliation Service. The firm started to return to the Taft-Hartley Law in January against any stopping or vital defense production.

Other labor developments

• Boeing Co. Roots of electrons at the union shop shop at the Boeing plant in Seattle and at the Vought Division in Philadelphia, both for 10 weeks, are expected immediately. The union recently agreed to the election under White House pressure. The mechanics union agreed to postpone possible strike action until at least Jan. 15.

• McDonnell Aircraft Corp. IAM and management continued to be optimistic last week, that a general labor settlement could be reached, despite an overwhelming vote to strike—approximately 7,500 to 1,170—IAM members.

The strike followed insertion of a three-year contract proposed by the company. The contract had previously been mainly accepted by the union but was mainly rejected by the 8000 striking mechanics. McDonnell management and its 16,000 non-striking workers have been deadlocked.

Under Taft-Hartley, if no agreement is reached within 60 days—or by Feb. 1 in the Lockheed case—as election must be held on a final proposal in management within the next 15 days.

Rejection of the proposed amounts to a ratio by the workers that will soon reverse the trend at the end of the 10-year period. Meanwhile, Administration pressure is being applied to Lockheed management to bow to the union's proposal that the union shop shop. To be done by a voice of workers and not necessarily agreement. Defense Dept. is releasing the union's further proposed contract commitment with the company (AW Dec. 3, p. 27).

The worker administration was recommended by a special board, appointed by the President to advise on aerospace disputes. It was headed by Dr. George W. Taylor. Other aerospace firms have gone along with the Taylor board's recommendation, which a two-thirds majority is required to establish a union shop (AW Nov. 26, p. 30).

Lockheed's strenuous objection of a worker shop, which the company says

AIAA Formed

New York-American Rocket Society and the Institute of the Aerospace Sciences formally merged last week into the 36,000-member American Institute of Astronautics and Astronautics (AW Nov. 26, p. 27).

Dr. William H. Federer was announced as the first president of the AIAA. Polking is director of the 3rd Propulsion Laboratory of the California Institute of Technology and was president of the AIAA in 1962.

The AIAA, which will begin operations in February, will have headquarters in New York and facilities in Los Angeles.

Other AIAA offices include three vice presidents: Dr. Marion S. Townsend, professor at Princeton University; Harold T. Landon of Lockheed Missiles and Space Co.; Eugene C. Cole and George T. Tsigas of General Atomic Engineering Corp., Bethesda, Md.

President of the AIAA will be R. Dennis Speer of New York and executive secretary will be Paul Johnson, previously director of the DAB.

James J. Harford, now executive secretary of the AIAA, will be deputy executive secretary.

Over-all responsibility of the Biotechnology and Biomanufacturing Office is development of advanced control and life support systems and better understanding of crew and machines and their integration.

Tippie and his staff will be responsible for research into integration and utilization of aerospace control systems. Dr. Del Dotz will be in charge of research and design of systems to protect against and provide for survival of crews on automated and space missions.

Japan Permits U.S. Tracking Site Survey

Washington—Japan has agreed to permit U.S. space officials to survey its islands for possible satellite tracking stations.

National Aerospace and Space Administration officials favor sites in the Ryukyu Islands and the northern island of Kyushu. However, Japanese news agencies report local opposition to such proposals.

Japan's government has attached these conditions to U.S. tracking site proposals:

- Stations must be for peaceful purposes and not interfere with regular radio communications.
- Operation of the stations must be Japanese authority.
- Tracking stations must be able to receive radio signals from other radio stations as well as satellites.

U.S., USSR Approve Joint Space Tasks

By Ward Wright

New York—U.S. and Soviet governments have formally approved their joint program for the peaceful uses of outer space. Programs, put out of bilateral links between Dr. Hugh L. Dryden, deputy administrator, National Aeronautics and Space Administration and A. A. Bugayev, academician of the USSR Academy of Sciences, held in Geneva, Switzerland last June.

Joint programs, which gave out of a March, 1961, exchange of letters by Soviet Foreign Minister and Chairman Khrushchev, were reviewed and updated by Ambassador S. V. Dobrynin, head of the UN, in a General Assembly committee meeting convened to consider adoption of the report of the Committee on the Peaceful Use of Outer Space.

UN observes number of recommendations and approval of U.S.-Soviet cooperative space programs in an number of areas. East West liaison, P. S. Krushchev and Premier Khrushchev approved the programs outlined by Dryden and Dobrynin. But 4 other recommendations were agreed but have not yet been ratified by the Cabinet council.

The other programs are:

- Meteorological research to be conducted in five planes.
- World Geodesic Survey to take place during the period of the International Year of the Quiet Sun (IYQS).
- Satellite telecommunications experiments.

First, joint working group is scheduled to meet next spring to agree on launching schedules for the experimental satellites. The members, orbit and compatibility of their sensors.

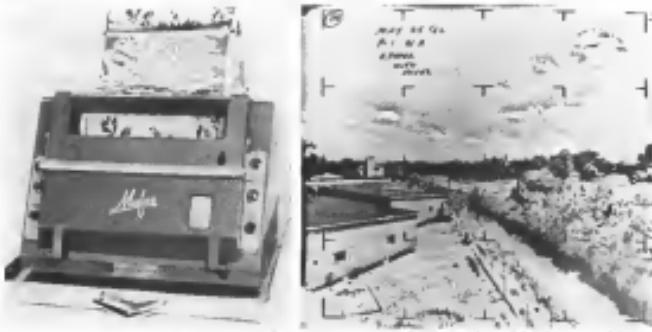
Joint Working Group of experts will meet in the next future to analyze and summarize data for the transfer of data gathered from the experimental satellites. These links would continue the World Weather Center established during the IYQS in Moscow and Washington. Working group will also consider and discuss the utility of other transfers in the program.

Group will establish criteria for the transfer of satellite data which will include selected cloud cover photos, especially those related to storms, various fronts and their origins. Geographical coordinates and cloud values also will be included in the transferred data.

Data will be agreed upon by the group for entering weather data from the two countries as proposed to exchange data of equivalent interest. The same data links will be used to exchange weather charts, diagrams, weather measurements and other materials needed for solving world weather problems.

Program will involve a coordinated launching of two satellites equipped with magnetometers during the period of the IYQS. Satellites will be launched on the same orbital plane at the same period but IYQS will be used for both functions to conduct their own magnetic measurements in space with a stated exchange of measured data.

Data gained from satellites, moreover, will be exchanged through the World Data Center in Moscow and Washington, established during the IYQS. Both nations have agreed to use



AUTOMATIC PICTURE TRANSMISSION (APT) SYSTEM is expected to have wide application in weather analysis and international forecasting. The system is planned for use in Nodules intercontinental weather, although preliminary flight test may be conducted as 1962 with first flight pictures due to take when satellite is within 1,735 mi. range of receiving station. Photos will be received and reproduced simultaneously from satellite transmission on special electro-sensitive paper.

AIRPORT WEEK and SPACE TECHNOLOGY, December 10, 1962

Navy Asks TV-Guided Missile Appropriation

Los Angeles—Navy is seeking appropriation of funds in fiscal 1964 budget for development of a television-guided anti-satellite missile, the Conifer (AW, Apr. 8, '61) possibly for use in an attempt on the McDonald F-104 and the Soviet MiG-21, possibly in 1967 and possibly the F-104B.

Some sources compare the missile to existing various elements of the system. North American Aviation's California Division has been carrying Institute studies under contract from the Navy's Bureau of Weapons and Naval Division of Northrop Corp a conducting extensive studies of the data systems which it intended to link with its launching platform over a range of up to 100 mi. Other companies which have expressed interest in the weapon to BWP include Martin Co., Douglas Aircraft, General, General Dynamics/Promers and Long Range Vikings.

Conifer analysis is to be performed by the pilot of a launching missile from a TV cockpit window displaying patterns secured by a camera in the missile while the missile is changing from the target area. The missile would be dropped from about 40,000 ft, falling about 200 ft. as its propellant would expire. Its projected range is considerably longer than that of the right-guided air-to-air missile Bulge missile. Full-scale development for the project is due with the Naval Air Development Center, Johnsville, Pa.

Should the Navy be successful in getting the desired funds in fiscal 1964, industry may be invited to participate under, perhaps, in the spring. The most developed form—whether Navy will select a single prime or a series of contractors—is not been firmly determined.

Navy officials have been evaluating various elements of the missile, for some time particularly the television tracking and guidance sections. One of these, called Wilfley (AW, Apr. 9, p. 31; Oct. 15, p. 26), looks like a cockpit selected by the pilot from a display of images obtained secured by a camera in the launching missile. This system was developed at the Naval Ordnance Test Station, China Lake, Calif. A somewhat similar one has been under investigation at the Naval Test Facility, Pt. Mugu, Calif.

Conifer test model has been under development at NDTS, China Lake, although much of the original work on it began at the Naval Ordnance Laboratory, China, Calif.

their reliance to expedite the flow of magnetic field measurement information from non-governmental organizations such as International Committee on Geophysics and Committee on Space Research (Cigaras) and the data centers.

In the field of satellite telecommunications, U.S. and Soviets agreed to cooperate during the remainder of 1962 and 1963 in conducting joint experiments using the R-117 and R-117B weather satellites. Conifer, for future joint satellite telecommunications programs, including development with other nations of a global system of space communications, was reserved for discussions at future meetings between the two countries.

In spite of the promising start given cooperative programs for peaceful uses of space by the U.S.-Soviet agreement, the General Assembly's First Committee in adopting adoption of the UN Space Committee's recommendations urged consideration of the legal issues involved.

Space committee report, completed last September, not to have been distributed from time to time, concluded from its two subcommittees—the technical subcommittee and the legal subcommittee. However, the legal subcommittee was unable to reach agreement due to conflict over cold war strictures in the role of communications satellites and

whether general instruments to measure basic principles for peaceful space exploration can be laid down.

Report of the technical committee, urging wider exchange of scientific data among nations from non-governmental agencies such as Copley, United Nations Educational, Scientific and Cultural Organization, World Meteorological Organization (WMO), a general and amateur sounding rocket facility committee in general and research into atmospheric areas, is expected to be adopted early this fall at a conference.

At present, U.S., USSR, United Kingdom, United Arab Republic, and Canada (in conjunction with the U.S.) have various draft resolutions pending consideration before the Space Committee.

Soviet attitude at the UN is that the problem of working out legal norms nevertheless for peaceful development of outer space should be referred to the legal committee for further study.

Sen. Albert Gore (D, Tenn.) told the UN that there was no worldwide division between military and nonmilitary uses of space. To handle military activities in space, Gore said, nations must work for general and complete disarmament.

Gore said the U.S. had no intention

of using satellites compelled to do so by the Soviets. He endorsed the UN space committee's recommendations, which called for a division of whether information gathered by satellites, and increased the U.S. National Weather Satellite program. Nodules, he said, could furnish weather information around the world to an inexpensive ground control system such as NASA's Atmospheric Particle Transmission subsystem (APT).

The system, Gore said, would cost about \$30,000 and would introduce automation to receive direct transmission of local cloud cover.

Atlantic Research Management Changed

Top management of Atlantic Research Corp has been reorganized, and Dr. Arthur W. Sleath, former board chairman, has been elevated to the new post of chief executive officer.

Atlantic's board, following a live-wire symposium in the testing of Atlantic Research Corp stock (AW Nov. 26, p. 97), resigned the company's organization to that:

- Dr. C. C. Slesnick, who was president, became chairman of the board and will devote primary attention to the technical program of the company.
- Dr. Sleath becomes vice chairman of the board and chairman of the executive committee as well as chief executive officer. He will be responsible for overall policy matters and for financial direction of the company.

- M. Lee Rhee, previous president and a board member, with responsibilities for general management of the company's day-to-day operations. Rhee was vice president and has directed company programs in solid propellant rocket development and also in valuable systems engineering.

Soviet Circumlunar Plan

Washington—Soviet Space Agency Nodules has not yet decided on a circumlunar flight late next year.

Molotov made no report after visiting Russia to inspect a Swedish-built TV equipment in which Soviet pilots are training and to attend a USSR Academy of Sciences meeting.

Soviet Embassy here told Aviation Week & Space Technology the device was built by the Aca Co., the largest electronic components manufacturer in the country.

It is planned to launch in Vietnam, about 300 mi. west of Saigon.

Aca and it's defense contractors are to the measurement training center in Russia a year ago.



Russian Ship Begins Return Of Il-28 Bombers



These figures of the B-17B Bingle are based on light loadings as visible on the deck of the long range Convair cargo ship Okhridskiy leaving Cebu. The ship was photographed in U.S. command waters about 60 miles east of Cebu on Dec. 16, 1944. Like returning B-17s, incoming ships (VW Nov. 29, 1944) the Okhridskiy shows considerable hull hull below the water line, suggesting light loading. Cargo holds are the hold where the aircraft are stored on 80-ft. high steel racks. The ship is the *Okhridskiy* (VW Nov. 29, 1944). Pictures are the property of the author and may not be reproduced without permission. The ship was at ports without hull bottom support and, except for forward deck, Okhridskiy's bottom is visible. Note the long, long Okhridskiy's hull, reflecting fully of white smoke.

Three LEM Engine Contracts Due

Only man item from Grumman Aircraft Engineering Corp. has been at session
National Aeronautics and Space Administration Marshall Space Flight Center is
a space Dec. 5 to discuss the concept for the laser executive module
and to select the list of subcontractors, as the satellite

The LEM subsystem (AW Plan 12, p. 29) will be used to land two Apollo modules on the moon and return them to the Apollo command module. A principal goal of the system is to realize propulsive and translunar injection. An agreement has been reached between Germany and NASA that these contacts will be avoided for these two systems.

engine, for low landing, will avoid extensive absorbing updates, and developed in two parallel programs, one using the sessions spectrum tool (W-Nec, Fig. 27) and another employing a randomly generated satellite. Evaluation of these two approaches, after prototyping, would select a solution of a single contractor to develop the fault system, which would

Initial test flight for orbital insertion and rendezvous with the orbiting Apollo CSM will involve a fixed nose injection, affording limited floating, approximately in the ratio of 3 to 1, by varying propellant flow. Propellant would be some 1000 lbs/min. range.

as LEM power controller will manage the propulsion developments. Spacecraft Center and is expected to award sub-tasks contracts under the program. Final contractors for the main engine are expected to be selected by American Aviation's EnduroNet Division, United Aircraft's United Engine Company, Alliant-Crosswell, and United's Reaction Motors Division. Bell Corp. is the overall contractor for sub-tasks selection to develop the test engine.

House Space Group Challenges Advent Program Cost Effectiveness

Johnson-Home Seeser and Associates expressed further concern over the wisdom of granting any military communications system by defining it with Defense Dept.'s unclassified plan justified as a cost effective

operations, tracking and data subcommittee resisted an immediate committee request for publications before the multi-year effort could be fully developed. A dissenting paper?

ANSWER: $\frac{1}{2} \ln(1 + \sqrt{5})$

committee, headed by Rep. R. L. Lamm (D-Colo.), and in it it would be "pressured" to the Adventist medium attitude on the military programs before any like Sessions were introduced.

To develop a new satellite between the Relay Teltar and satellite vehicles would be avoidable complication (except for transmission of proper frequency) by dispensing the development. It has been carried out by the House subcommittee report

Committee's report is based on
September and October on
our military communications

Decision Unit Urged For Nimbus Program

Washington—National weather satellite programs should be reorganized, so that it is "a matter of agreed" to settle differences between the Weather Bureau and National Aeronautics and Space Administration, the House Science and Astronautics Committee Subcommittee on Science and Application last week.

"The relationship existing between the Weather Bureau and NASA," the subcommittee said, "is basically one of opposition, strongly implying that, in instances of irreconcilable conflicts of judgment, there are no agents of agreeing and deciding other than at the presidential level."

The subcommittee recommended creation of a 'court of appeal from which oral and hearing decisions can be obtained.'

The subcommittee report was based on hearings held Aug. 28-Sept. 21. The Dept. witness at the hearings concluded the Nimbus damming had stopped about a year from the original target date of the second quarter of calendar 1982.

Dr. Maxine Tippins, NASA waffler, was dead, and during the hearings at NASA was conducting the Novus program on an "as soon as possible" rather than "as fast as possible" (AW Sept. 1, p. 17). The subcommittee recommended that NASA make it clear that there is no need for urgency in the Novus program. In contrast to Tippins, Dr. S. Fred Singer, National Weather Service's Contingency director, said during the hearings that he was aware the agency was conducting Novus.

• **Testbed Burne**

—Anne Vulcan boulder northeast of the Brundt Soddy Cliffs near 32 E. This was destroyed by fire last week.

plane was being used for ground tests when the fire started. This had spread over the canopy, destroying some. There were no injuries.

the Volcan, which caused the Olym-
pia II as a double strike and drag on
the belly (SW Oct. 18, p. 181) had
lasted about 180 hr at right low.
It will be several months before a
criticized can be undertaken.

of the Volusia will mean a date in Florida's T-382 state assessment aircraft program. A version of the aircraft (which includes no radio stage) under development for the past two years is the experimental transport program engine is designated the Olympus Component form for prototype to the new being evaluated by Florida

Five Airlines Claim Industry Is 'Healthy'

Joint statement reverses earlier stand; move seen as attempt to block merger plans of American, Eastern.

By L. L. Dely

Washington—Five U.S. truckloaders last week broke ranks, made to define the airlines as in a "healthy" financial condition, as a abrupt switch from the carriers' unassisted public position at least two years that the industry is in dire fiscal peril.

In an unprecedented action, the five carriers—Braniff, Continental, Delta, National and Northwest—issued a statement through a public relations firm here that they were "fed up with the constant refrain being circulated by Eastern Air Lines that our industry is in critical financial condition." The move is expected to have far-reaching effects on the public relations posture of the industry.

The statement is viewed here as being directed against the proposed Eastern-American merger. For some time, airline truckloaders have been battling against American-Eastern partners in waging the personality clash. Eastern can claim that the industry is an argument for these changes.

The action of the five carriers is particularly interesting, since it contrasts sharply with the solid stand taken in 1956 when the fight for a general fare increase began. At that time, there was no dissent from the airlines' position that their industry was in fiscal trouble, although this stand was taken during some of the industry's most prosperous years.

The new stand by the five carriers which handle some 20% of the nation's domestic air cargo business, was probably and undoubtedly made for the purpose of quashing the merger, although

Concorde Parameters

London—Master of Aviation Julian Armyt work and the first Anglo-French supersonic transport, the Concorde, will actually enter at \$17,000,000 it, and will have a landing speed comparable with a Boeing 747, about 150 ft.

Avro and Concorde's nose will be lower at London Airport than gives that made by 70%, because the transonic flight will be steeper. Mach 2.2 cruise speed will not be attained until the altitude is 100,000 feet from London because of supersonic losses.

The Concorde's range, 3,000 miles and 600,000 lb, will be derived almost solely from economic inflation over the North Atlantic and will be less than half the normal maximum (\$10,000 million) for supersonic aircraft.

The Concorde's range, 3,000 miles and

known in the Fitter Study. This study upheld the smaller carriers' contention that a minor margin of 10% for the "intermediate air carriers" is the reasonable economic requirement.

Rate of return for the entire truckloaders was 11.1% in 1955, 39.9% in 1956 and 2.7% in 1958. Profit margin on sales was 1.4% in 1959 and 0.1% in 1960. It should be recalled that National, while it did not appear a fare increase during the proceedings, did not participate actively in the negotiations.

The present flux of change and counter change does not imply that a new leader has developed within the industry. For example, industry division over the merger case has not reached the intensity that marked the fight for routes in the CAB New York-Florida Route Case.

The present situation, however, does furnish a significant change in the structure of the truckloaders' organization. For several years, beginning with the General Postage Five Incorporation, the ATA has presented the truckloaders' industry publicly as being in financial difficulties.

Reasonably, this image was designed to protect the industry against future higher taxes, size changes and similar additional expenses beyond the control of the carriers. Presently, several small carriers have opposed the policy on grounds that it hampered the floating of some under-subsidized firms and the raising of new capital.

Worries, which has taken no part in the merger proceedings, stepped out of the dispute, as did United.

The five carriers, particularly Delta and National, are clearly at a political, though financial, disadvantage.

Thus, if the group of five carriers manages to mount the prospects theme,

Indian Supply Drops

India's non-scheduled airlines, using DC-3s, have been making supply drops and assistance flights in the forward battle areas at the Indian-Chinese border dispute according to a story in *The Statesman*, an English-language newspaper published in India.

Aircraft and crews of *Kalinga Air Lines* and other three non-scheduled operators—Aeromexico, Indian and Daikishin—have been using 11,000 lb aircraft flying at altitudes between 18,000 ft in the northern areas.

One safety has resulted, Capt. S. Kishore of *Kalinga* being killed in a crash Sept. 21 while dropping supplies of *Tawang* over the little-known *Sela* pass of the *Siachen* range. Several of the civilian crews have received press and military aid stations for their work at dangerous areas.



New Photo Shows II-62 Tail Design

Extremely nonconventional elevators and split rudders characterize the tail section of the new Douglas II-62. Another major tail transport (AVW Dec. 15, p. 47), the II-62 passenger aircraft is powered by four Allison engines rated at approximately 13,000 lb. gross each. Engines were designed by an office under N. D. Karsner and the airplane is in use at the design offices managed by Super Constellation. Engines are mounted on a truss surface whose chord plane lies above the centerline of the powerplants. Controls at the rear do not attempt to separate the function of ailerons and rudder. Long drive spars extending forward from the base of the fin are used in systems. Edge control is the rule at the tail. The empennage has the propulsive air at the trailing edge of the wing flap extended on to the trailing edge of the engine nacelle surface. Reasons given for the airplane was designed to reduce the *McDonnell* New York was mounting with unusual extension of a center speed of full scale.

a serious split within the ranks of ATA could occur. Even if the five carriers would sacrifice some support for the group, needs of least three airlines—Eastern, Northwest and TWA—are in no better end condition at this time to make even a pretense of alliance.

The five carriers expressed confidence in the future of the airlines and that the industry "has satisfactorily met and overcome the major financial problems that stemmed from the swift policy to jet transport aircraft transition."

The statement said that Eastern saw a loss in 1962 due to the eight engines' strike, but pointed out that *Mid-Atlantic* had learned that Eastern would show a profit this year. It added:

"That for 1962 Eastern has noted a loss of \$75 million, which, on the basis of 1961 for base, indicates total earnings, but has not taken into consideration the \$16 million which has been

paid to Eastern by other airlines participating in the Mutual Aid Pact."

The five carriers suggested an agreement in TWA's position by noting that, while the carrier lost money during the first half of the year, the second half was a profit period for the year of 1962. The point was that Northwest has recently learned what it considers adequate financing to carry the company to a profitable level. They concluded:

"The present difficulties of Eastern, TWA and Northwest are not typical of the airline industry as a whole. There hardly are exceptions to the general healthy state of the industry, which is strong and thriving for all its problems, competition, and jet transition costs."

Mid-Atlantic took the position in response to the statement of the five carriers. "While it is true that Eastern Air Lines has been in some financial difficulty, the ATA's position is outside the point of a profit and loss for either of those five years (1960-61)."

Mid-Atlantic concluded: "Finally, this will have to speak for themselves. But, I note that the two carriers that are relatively healthy, and have earned the most according to their most recent reports for 1962, Delta and National, both operate over the routes of Eastern while it was on strike this summer and both benefited by the award to them of transoceanic routes from the southeast U.S. transcontinentally to California."

Finnair Buys Caravelles With P&W Engines

Paris—Finnair has just signed a contract for six new type Caravelles to be equipped with P&W turboprops, marking the first aircraft sale of a Caravelle with U.S. powerplants.

As predicted in *AVIATION WEEK* (Nov. 20, p. 49), the French carrier signed its first Caravelle with Pratt & Whitney JT3D-2 turboprop engines. Finnair will take delivery on the first five aircraft between May and August, 1964. The sixth will be delivered in March, 1965.

Finnair will call on six aircraft the Caravelle Super B originally, but will label it the Caravelle Horizon B.

No price was mentioned in announcing the sale. More important, no assurance was made that had Air Alsop, as part of the consortium, not agreed to accept Finnair's first order Caravelle in partial payment on the new order.

Reportedly, Super Caravelle B price is \$16 million. Total in prior sale offered. Finnair is understood to be paid only \$15 million, plus about the price Finnair paid for its earlier Caravelles

Boeing Expects Full Production In Transport Division for 10 Years

Seattle, Wash.—Airline traffic forecasts conducted by Boeing Co. have convinced the manufacturer that it will have a full production line in its transport division here for at least another 10 years.

Production of its latest model, the short-haul 727 narrow-body transport, the short had 727 narrow-body transport (SWB) Dec. 3, 1970, at a rate of eight planes per month after 1968, along with an anticipated production of three to four 720B medium-haul transports per month until 1985-1970, is expected to give Boeing a new impetus following falloffs in the airline industry's acceptance for long-haul transports.

Boeing's family of 70-75 aircraft now ranges from the intercontinental 707-300 to the 727. Either virtually all scheduled airline orders will be short-haul transports—a very short haul here—since no long-haul transports.

So far, 15 aircraft have shown extensive interest in the Boeing 747. BAC 111 bypassed the 727 for short-haul operations. Several foreign, mainly American Airlines, are withholding any decision on this aircraft until Boeing Aircraft Co. decides whether to produce its proposed short-haul 1985 transport.

Boeing considers the BAC 111, the Caravelle and the de Havilland 111 Trident its principal competitors in the sale of the 727. Nevertheless, it is not evident that it will sell a maximum of 900 727s in a market which, the manufacturer believes, falls at least 1,000 aircraft in the 727 type.

The 727, which has been a success in the market for the development of its family of jet aircraft. Essentially, the foreseen growth was developed on the theory that lower fares, which could generate new routes, would be introduced and that the "jet economy" could help open new markets.

The company admits that the expansion of its fleet is a direct result of the acceptance that lower fares, based on the higher productivity of jet aircraft, would be introduced by the airline industry instead Boeing Inc. has

EEC Cartel Rules

Paris—Transport ministers of the nine-nation European Economic Community (EEC) have decided to exempt all transport services temporarily from the antitrust cartel laws.

Meetings, meeting in Paris, and the exemption would run until Dec. 16, 1981. By June 1982, EEC experts will be expected to draw up special antitrust regulations for transport operations.

were issued and the forecast, therefore, is probably over-optimistic.

With respect to the jet jet, Boeing would have traffic growth. Boeing applied its growth rate in the 1958 base, which is back at the current level of the projected passenger aircraft. In its argument that present jet types will provide a new impetus to traffic, however, short-haul 1967, "when the cost of potential will have been fully exploited."

It found that the domestic traffic growth rate between now and 1987 will be between 8 to 9%, of which 5 to 6% will be new growth and about 1% real growth. The latter is based on the overall expansion of the economy and population, the former on the opening of new markets and the attraction of jet travel.

The manufacturer further assumed that the 1967-1968 generation of aircraft would, in turn, still will spark future traffic growth, although the ultimate growth rate will probably be substantially lower than that in the preceding period, perhaps between 4 and 6.5%.

Boeing puts the conclusion on the forecast a prolonged business recession would create a consequential decline in air traffic, its forecast occurring only when the economy recovers.

"Even then, the airline industry is becoming increasingly vulnerable to economic fluctuation, a typical tendency of marketing activities," it said.

"Even so, the airline industry will be overcapacity, will be overcapacity."

Boeing felt that more optimistic forecasts were based on a "share-of-the-market approach." In this scenario, the manufacturer's forecast noted that the total common carrier traffic market has remained constant for a number of years.

The forecast thus finds that a growing volume of air travel can be anticipated, which should leave the common carrier load spread. In addition, the Boeing study does not limit the airline to common carrier traffic load, it claims that load can be increased by 10% (Aviation News Dec. 15, p. 41).

"Last year we declared," the manufacturer reported to the association's own system. "The breakers had been load continued to decline. New operating changes appear to have about reached a peak so that no further pressure on earnings is visualized from these changes."

Capacity is not expected to increase greatly in 1984, the report said, and despite deliveries of Boeing 757 jet transports. During a general economic decline, the committee forecasts continued benefit from the factors cited for 1967's expected improvement.

Boeing's long-haul and U.S. inter-

national airways are expected to be 110 billion passenger miles in 1975, compared with the 75 billion passenger miles flown in 1961. The survey found that foreign and U.S. international carrier traffic has exceeded that of U.S. domestic carriers, and added:

"By 1986, foreign flag airline traffic is expected to exceed that carried on both U.S. domestic and U.S. international airways. Foreign carriers will grow substantially and the lighter rate will be U.S. domestic airways."

In its international forecast, started last year, Boeing saw airways considerably more optimistic than other similar forecasts undertaken earlier by Cavan, Canada, International Civil Aviation Organization and Eurolink, which was the last optimistic of the group.

Boeing found that traffic growth on the plain North Atlantic route was about 28% in 1979 and 1980 and about 35% in 1981. It forecast an average 18% annual growth factor as shown below for the period through 1986.

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Boeing's long-haul and U.S. inter-



Ethiopian 720Bs to Begin Service Next Month

Ethiopian Air Lines will commence service with two Boeing 720B jet transports Jan. 14, using the aircraft on all of its routes throughout Africa and India with Greece, Spain and Germany. Fleet 7800, shown above on a recent test flight near Boeing-Seattle, and its sister ship were flown to the new airport at Addis Ababa only this month. Aircraft is powered by two PW107-100A turbofan engines.

ATA Reorganization, Advertising Plans Deferred; Budget Cut 7%

Washington—Air Transport and Board of Directors last week deferred immediate action on a proposed sweeping reorganization of the association and a phased \$5 million annual rate advertising campaign.

At the same time, the Board of Directors cleared ATTA's 1983 budget for \$11,149,000, a 7% reduction from the 1982 figure.

Both advertising and reorganization were voted to committee by earlier last year, a move that has not materialized here to increase the total cost of both proposals. The reorganization plan will take little additional and at least one major function is known to be strongly opposed to the advertising campaign and another is known to be little more than a. However, most of the functions supported the advertising plan.

The advertising campaign is to be a step-by-step management committee appointed by ATTA president Robert G. Tyson. The committee will be responsible for the development, content and objectives of the campaign. Committee members are to be submitted to the Board at its next meeting in March.

The plan for the campaign emerged last June at the mid-year directors meeting, when the ATTA was directed to prepare a presentation for consideration by the Board. The Soltrene, Stratton, Calvert and Barnes advertising agency prepared the presentation.

Tyson was instructed to name a special committee to study the reorganization plan, which was developed by the

ATA staff in conjunction with the Herr Goldguy Co. of New York, a firm of management consultants. Both justify the plan cited for the elimination of ATTA conference and a strengthening of the ATA organization so that conference activities could be handled by ATA staff personnel, rather than by

SST Acceleration Urged

Washington—See *Class Eagle* (D, Oct. 11) last week for the Federal Aviation Agency to accelerate the supersonic transport project to that the U.S. can retain its superiority in commercial aviation.

In a letter to Federal Aviation Admin. director N. F. E. Herle, Eagle called on the agency to determine whether the U.S. can fly a supersonic transport by 1990 and have it in commercial service by the end of the decade, the same target date set by the British and French for their joint March 2 supersonic project (AVN Dec. 8 p. 41).

Eagle said that if the U.S. does not meet the British-French challenge, it will lose its world leadership in commercial aviation, along with 50,000 jobs a year in 10 years.

Eagle added, "...as in the view of many experts that we should go for the March 2 supersonic, or use the technology we now have in the March 2 category, and to make them step by step." First research monolithic for a supersonic transport project by the U.S. is to be submitted to President Kennedy by Herle no later than Jan. 1.

There is no point in discussing in this case the question of whether Pan American and TWA should stand point-to-point, as far as price, competition, or whether TWA's stand around the world service should be discontinued when one of these carriers may within a short time no longer exist.

Seaboard proposed a deferral of proceedings in the case until the issue is clarified.

representatives and officials of the unions in the case.

Consequently, among the directors agreed to be that, while the Air Transport Conference may have its weaknesses it should be recognized rather than folded.

The committee stated to evaluate the Goldguy plan is to examine how industrial procedures can be used upon through the ATA.

Direction also voted to establish the Office of Environment at permanent department of the association.

Pan Am-TWA Merger Plan Expected Soon

Washington—Proposed Pan American World Airways merger with Trans World Airlines was the subject of speculation but little work. Changes appear strong that a joint announcement confirming a full merger agreement by the two carriers will be made next week.

Meanwhile, Seaboard World Airways apparently planned a Civil Aviations Board estimator's ruling that the two airlines will not be required to submit annual studies pertaining to the merger plan in the Transatlantic Route Selection Case. In taking issue with the ruling by Economic Commissioner Keith Schlesinger.

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MAINTENANCE... AND THE WORLD'S LARGEST AIRLINE



The jet inspection that never ends

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Beech Negotiates DH-125 Distributorship

Negotiations are under way between Beech Aircraft Corp. and de Havilland Aircraft of England for distributorship rights to the DH-125 executive turboprop aircraft. Talks began almost two years ago, but apparently have been renewed with increased intensity during the past five months.

Frank E. Hrdlicka, Beech executive vice president, told Aviation Week that under one possible program de Havilland would gain the use of Beech's entire international sales organization for the DH-125.

Beech would handle U.S. sales.

Coupled with these negotiations is Beech's delay in making a firm decision to go ahead with production of an eight-passenger, twin-turboprop Model 128. A meeting of the executive committee of the company is scheduled for January to decide on the timing of the turboprop's introduction.

Original plans called for this aircraft to fly in 1968 and for first deliveries in 1969. But Beech has been reported to be slightly off schedule on the project (AW Dec. 1, p. 110).

Hrdlicka admitted that any agreement to market the DH-125 in the U.S. would not necessarily mean discontinuation of the Model 125. He said it was possible that both aircraft might be able to live together in the same environment.

DH-125 currently is flying in England and is in production at de Havilland factories at Hatfield and Cheshire, England. Royal Air Force has received 22 and two have been purchased by private firms (AW Dec. 1, p. 110).

Beech is one of several American companies which have been talking with de Havilland regarding possible U.S. distributorship rights. Included among these companies is Pan American World Airways.

However, de Havilland probably is in need of an extensive worldwide marketing organization which a large American manufacturer, such as Beech, would be in a position to provide.

Beech, on the other hand, is in no position looking for an assembler to complete with American-built turboprop executive aircraft, such as the Lear Jet and Jet Commander 312.

Discussions between Beech and de Havilland also are expected to have touched on the possibility of de Havilland building the DH-125 ashore and sending it to the United States where Beech would add the wings and engine, but this is at present regarded as a doubtful possibility.

Modified Swissair 990 Shows Speed Increase

Zürich-Int'l. flight tests of an optional Swissair Convair 990 medium-range jet transport modified to a long-range configuration indicate that the aircraft gains an additional 50 mph in maximum cruise speed plus a reduction in specific fuel consumption.

First flights to be modified here at Swissair headquarters under Convair direction was referred to regular service early last year. After several pre-testing flights over the previous year, the aircraft has a supersonic engine from San Diego plant. Aircraft work, however, was carried out by Swissair technicians.

Modification Costs

Convair, which will absorb the cost of modifying all 55 990s operated by Swissair plus two others which the airline has leased to Scandinavian Airlines System, supplied the kit for the modification, which is a supersonic engine from San Diego plant. Aircraft work, however, was carried out by Swissair technicians.

Tests showed that the true maximum cruise speed of the aircraft was increased from a previous 590 mph to about 620 mph at altitudes of 26,000 and 39,000 ft. At one point, with a tail wind of about 65 mph, the modified 990 reached a calculated ground speed of 661 mph. Federal Aviation Agency has confirmed that 990s for a maximum cruise, true airspeed of 621 mph.

Airline officials say fuel consumption

showed a marked decline as Mach numbers of 0.80, 0.84 and 0.88. Darii figures on the percentage decrease, they said, cannot be established until after

tests are completed.

Swissair expects approximately two months to complete the modifications on the first aircraft. Second aircraft is scheduled to enter the dock early this week, and, as work progresses, Swissair officials say the total required to complete the modifications on an individual aircraft should be substantially shorter.

further operational tests have been completed.

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Cuban Route Boosts CSA Passenger Totals

Prague-CSA Czechoslovak Airlines estimates it will carry more than one million passengers a year by 1963 at about 150,000 and log a total of approximately 47,832,100 km en route in route structure during 1962.

A major factor behind the boost, according to the airline, was the British Bahrain route to Havana which began early this year.

Passenger services to 74 cities in Europe and the Near and Far East, Asia, Africa and Central America will total 79,500,000 for 1963. Domestic services between 11 points throughout the country account for 17,130,000 km en route, and two operations for the remaining 32,106 km are of the total figure, according to CSA.

The airline's total route mileage is 62,000 statute miles.

In 1961, CSA handled 858,355 passengers and flew 15,481,613 km en route.

Most profitable routes, according to Czech Foreign Ministry of Transport officials, are CSA's Prague-Havana, Prague-Dakar and Prague-West African services.

London Airport Fog

London-Fing field visibility to 10 yards at London (Heathrow) Airport and completely halted airline traffic there this week. In a previous period, the only airplane to land at Heathrow was a Mariner plane of American Varsity Varsity flight for airborne landing (AW Nov. 5, p. 47).

International carriers diverted North Atlantic flights to Paris, and at the end of British Airways' Atlantic Corp. Trans World Airlines planes flew over London for Frankfurt. British European Airways Corp. canceled 80 flights in a single day, operating a few out of London. (Globe and Mail) during two periods of closing fog.

London landfall in poor visibility after a flight down, Black Landling En permit to land that has at Black Landling. Air craft is equipped with Smith Aviation Division autopilot and auto-throttles. Dreyfus' guidance was provided by Heathrow's ground ILS system.



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Eastern Pilot Tried Go-Around Prior to DC-7B Crash at Idlewild

By Jason R. Ablow

New York — Federal investigators probing the Nov. 30 crash of an Eastern Air Lines DC-7B at New York International Airport here have the chipped tips of two small tools to indicate the plane's descent rate and path prior to ground contact.

Soaring through the clouds indicates the aircraft was not descending at a rapid angle, but was moving downward at approximately 3.3 deg. The plane was also following a course several degrees left of the runway's 40 deg bearing.

By only spaced dashes in the red slot, that the aircraft descended much the ground first. The engine and undercarriage of the fuselage then hit a knot, ripping open the left wing and fuel cells. The ground dry vegetation at the point.

Rocks directly in front of the first impact point were untouched, indicating the plane bounced back into the air before hitting a second knot, just short of a runway. Blasted granite in the terrain immediately to the left of the impact zone from which point the plane descended approximately another 100 ft.

The left wing stalled to the right and landed in the left slot. The right wing also severed, landed upside down to the left and bottom of the cockpit, arousing the belief that the engine, suggesting severity, followed causing a stop. A hole was cut out of the vertical stabilizer with hammer blows. The first section of the top rear fuselage had been removed intact. One can sense practically all of the fuselage, but not before 25 of the 51 persons aboard had escaped.

Capt. Edward Bischfeld, 41, a 16,000-hr pilot and captain of the Airline Pilots Assn. eastern U.S. region, died with the two other cockpit crewmen. The right rear horizontal stabilizer.

Ground fog, which caused an approach error, the reported presence of a pilot's unfamiliarity with the aircraft, and the lack of a go-around were made to Bischfeld. The plane never cleared the runway, but instead an entire degree to the left and ended 4,200 ft. down and 500 ft. to the left of the stop. Gear was retracted, leading investigators to speculate that Bischfeld was attempting a go-around after a missed approach.

Communication with the pilot just before the accident, which occurred at 9:47 p.m., indicates that at one time he did have visual contact with the runway, lights, and miles just below him descended into the shallow ground fog, investigators said.

Bischfeld reported that the tower said the high intensity flasher beacon which marks the runway approach path. The lights cannot be dimmed, but were turned on to assist with the pilot's descent.

Flight was N.Y. 512, arriving nonstop from Charlotte, N.C. Field conditions as reported to Bischfeld by tower personnel and were one mile visibility with ground fog.

The fog was described afterwards as being fast forming and shifting, with dense moving patches. The threshold of runway 18, a new one, the shore of Jamaica Bay, where investigators say the heaviest patches might be expected under conditions existing at the time.

An Eastern Airlines board of inquiry, including two members of the 20-man crew, the CAB will determine whether the statistics in its test using an Electra and a DC-3 to determine whether the running Electra, passing near the Jamaica Bay Landing System transmitter shore, may have affected the ILS base.

Perimeter Approach Radar has been inoperative at Idlewild since Nov. 15, equipment for the next being selected at the Idlewild tower. Notices to airmen (NOTAMs) were issued, and tower personnel also informed inbound flights of PAR unavailability.

A narrow transom antenna's usual range which measures visibility at the runway threshold was 1.24 miles. The TAC-5 mobile marker had also been out of commission, but reengaged after a lagging opening at 9:49 p.m. Six minutes ahead of Flight 512's arrival.

ILS Approach

Investigative negligence that same afternoon, which could have caused a pilot's failure to make a normal ILS approach, Bischfeld had a visual contact with the runway, but failed to determine the rate of landing and at a determining factor in the crash.

During fog, he impeded the downwind leg of the approach and came in at an angle to the runway. The first was the assumption that the fuel supply of the four tanks was quickly exhausted and more was brought in the gallon cans from a fuel storage facility at the field.

Antoine E. Nozziour, CAB manager for New Jersey, came in New York to direct the early probe. He said a full investigation covering the full spectrum of possible accident causes will be conducted. Official hearings on the accident were expected until sometime after the first of the year. The hearings will be conducted in New York, New Jersey and.



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Gossamer Gulfstream 24-passenger transport, with large rear cargo door has received FAA certification. Max seat a maximum of 24 persons.

FAA Certifies 24-Passenger Gulfstream

Gossamer Gulfstream airframe transport has been certificated by Federal Aviation Agency with all accompanying documentation. 53 x 32 in., and a convertible interior capable of carrying up to 24 passengers or a single passenger and. Maximum gross load weight of the aircraft was increased from 36,170 lb. to 39,774 lb. without structural modifications. Convertible cabin has a fixed-track seat arrangement at extra length. Gulfstream can carry 24 passengers, baggage and passengers arrives equipped 1,400 seat-in-the-cabin in excess of 8,000 lb. of cargo 1,600 seat-in-the-cabin. Maximum capacity with increased load is 1,600 seat-in-the-cabin the aircraft can carry 24 passengers load plus 1,600 lb. of cargo over eight 100 m segments with no rebelling.



Seats in the 24-passenger Gulfstream have 15 in. pitch and are separated by a 16-in. aisle. The fixed-track system in the floor allows the seats to be removed from the aircraft cabin and cargo to be loaded rapidly.



Cargo/passenger seats in shown above, left with cargo in use of cabin. Right, Rolls-Royce Dart engine is loaded aboard aircraft which still has 32 seats in place at 1,200 cu. ft. cabin. Seats can be stored above overhead after removed from cabin.





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TWO ROLLS-ROYCE SPEY TURBOFAN ENGINES



STANDARD ARMY UH-1E shows traditional clustered appearance of most present-day rotary wing aircraft. Note diagonalizing struts, raised engine cowling, and off-color nose which indicates skid-off from landing.

Tests Show 250-mph. Helicopters Feasible

By Ervin J. Carlson

Fort Worth, Tex.—High-speed experiments of helicopters are being made at the University of Texas. For tests with a modified Bell UH-1E helicopter which has been used to confirm that 200-mph rotary wing aircraft are feasible now.

Speeds of 213-238 mph should be possible in the near future utilizing existing state-of-the-art technology, Bell engineers feel.

Tests by Bell Helicopter Co. pilots under a program sponsored by the U.S. Army Transportation Research Command (TRDCOM) to evaluate the effects of reduced drag reduction techniques are expected to study and investigate the potential of helicopters in the high speed regime. Helicopters, however, as they now stand, have limited potential in terms of speed, especially at speeds above 150 mph.

Copilot added, that from his own research, up to 200 mph, he would have had to add approximately 175 ft. of speed in order to maintain a standard helicopter high performance program, but on the basis of what he has been discussed thus far with the UH-1E, he would not settle for less than 220 ft. performance should he have to bring in specifications for such a vehicle.

As pointed out in *Aerospace Week* (Mar. 18, p. 247), a three problem line during high-speed performance of rotary wing aircraft has been high-drag configuration that would cause a helicopter to be less efficient in flying-wing mode.

Another problem is that the need to

attack the same machine to attain up to 270 mph, and the third is that losses incurred in the current program will be reflected in all other aircraft of the same class and configuration.

TRDCOM Design & Performance Division Chief Paul Carpenter expects that the research Bell UH-1E investigations will significantly influence Army Helicopter performance requirements for an attack helicopter.

Speed Requirements

As told *Aerospace Week*: "The research has automatically made the maximum speed requirement as any in the helicopter community by 250 mph,"

Carpenter added, that from his own research, up to 200 mph, he would have had to add approximately 175 ft. of speed in order to maintain a standard helicopter high performance program, but on the basis of what he has been discussed thus far with the UH-1E, he would not settle for less than 220 ft. performance should he have to bring in specifications for such a vehicle.

The consideration prompted Bell engineers to consider a broad fuselage configuration, permitting straighter fuselage loading, but featuring a fuselage width sufficient to take the length of the 36 ft. tail, resulting in a high-wing fuselage configuration.



MODIFIED BELL UH-1E shows effects of aerodynamic cleanup. Helicopter still had clustered nose when photo was taken, but flying now off most of it, along with engine. Axial sweeplet being installed to nose cabin and main rotor nose change was made.

Such considerations are compatible with a utility helicopter, but require severe speed performance limitations that are far short than the more massive aircraft designed for attack roles.

That aircraft had to determine if speed in flight loading was more important than a cleaner, more fuselage, which lower drag would provide increased range with the same power, in weighing these considerations.

Investigations are that more consideration will be given towards developing specific configurations for various duties to take advantage of design technology that can provide maximum performance rather than attempt to develop an all-around helicopter expected to haul, lift, or carry one day and deliver devastating firepower at long range, the test will much hope of high crew survival rates.

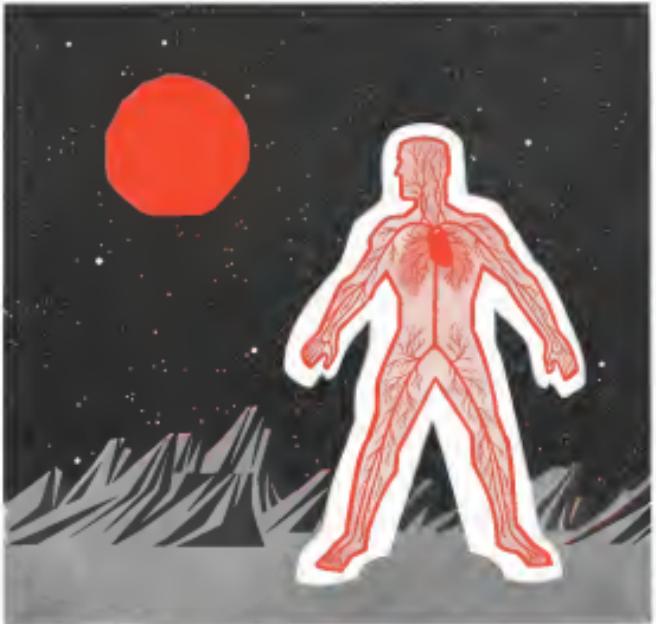
Helicopter Research

Concurrent research has been done over the years by industry and government agencies on various methods of increasing helicopter performance, but due to lack of funds being available to prove that theory in actual flight, little progress has been made outside taking advantage of this research.

National Aeronautics and Space Administration researchers at Langley Laboratories have been trying for years to get development started on a research helicopter that would be the counterpart of the X-24s of research aircraft, but the program regularly kept being deleted from the agency's



THREE-BLADE MAIN ROTOR mounted on research 180. Tail ring the motor mount is being driven to measure bend and chord bending moments of the hub and blades.



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The space-suit project, an important part of Hamilton Standard's life support program, applies diversified experience in hydraulics, pneumatics, mechanics, electronics, and packaging. Hamilton Standard blends and develops these basic techniques to achieve an integrated systems approach to life support equipment.

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sonic problem at high speeds but this could be solved and that there would be adequate stability at high speeds but actual flight tests would be the only way to prove these studies.

Results of these studies, which also indicated that fuel consumption could be reduced some 25% at constant speeds because of lower drag, generated considerable enthusiasm in the office of Army chief of transportation Maj. Gen. Frank Besson. Here is the obvious value in reducing fuel logistics problems.

UH-1B Modifications

Bell last fall was given funds by TRICOM to start a research program, utilizing a modified UH-1B, to evaluate the effects of drag reduction. One of the initial steps in the modification program, was to reconfigure a variable tilt main rotor system, to permit main turning at a level. The drag reduction attitude is high-speed forward flight. The reduction of drag on the fuselage also can down loading on the rotor. Bell engineers point out that the standard UH-1B maximum cruise speed approaches 100 mph. When loading on the rotor at 120 mph there must be enough drag to impede rotation.

Bell engineers have provided a nose mast tilt capability from 4-deg forward tilt through 11 deg. The entire nose transmission is mounted on a truss having an axis of rotation intersecting the axis of coupling between engine and transmission, so that the degree of misalignment of coupling during rotation is a figure with within the capability of the coupling. Gimbals, mounted onto the fuselage on pivots, are rotated by means of two electric motors; down, hydraulic actuators through an infinite range within the 4 to 11 deg tilt capability of the mast.

Fixed Tilt

The variable tilt mast feature is strictly a research tool; understand, in that a fixed tilt of perhaps seven degrees will be reasonable amount to provide desired performance. Should further testing show a definite requirement for going in fast at 10 to 15 deg., perhaps a two-position nose tilt position could be added.

The nose mast also has been tested with results of additional drag being provided and profile carburetor air approach, for 10 deg. angle of attack, indicating that tail rotor supplemental 50% at high speeds and providing an additional 10% (gross) to the main rotor system.

Most noticeable overall changes to the research UH-1B probably are the extensive fairing and reduction of jet-turbulence. A glass fiber hemispherical aero-shaped fairing, approximately 160 in. long and 60 in. high, is added to each side of the aircraft cabin to reduce the effects

of the normal fuselage suddenly narrowing at this point into the tail boom. A large, standard glass fiber pylon fair surrounds the tail mast and covers the normal protruding engine intakes.

Following large-scale drag and turbulent effects of protruding and fairing parts, including intake mouth plate, normal intakes are replaced by smaller, fixed intakes on either side of the pylon fairing, which are more efficient than the previous three-barrel glass fiber ducts. Indications are that these intakes provide more positive pressure rate than the standard intake across the engine compressor face, improving engine efficiency. Two small spring loaded panels, higher up on the sides of the pylon fairing, open up to provide air to chamber until pressure builds up

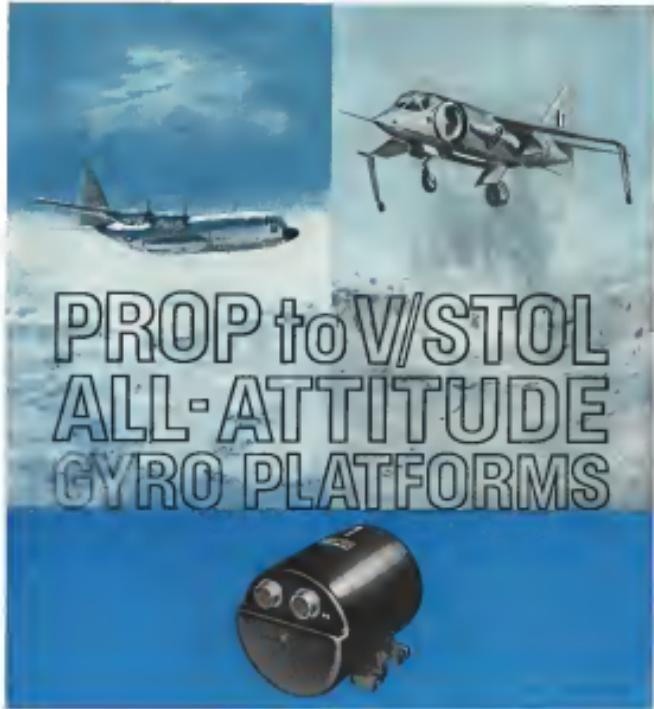
efficiently through the forward fairing outlet.

Bell is doing considerable study on revising the main rotor control system, modifying the main plate to enable control tube linkage to rotor pitch arms so to be brought in closer to the mast and thus presenting a reduced air mouth of the propeller. It is believed that this will result in a weight reduction of 100 lb. and a fuel savings of approximately two feet to 100 hr. range. Also to be tried are glass fiber fairings covering the main rotor blade gearbox.

Another noticeable change is the no-blade main rotor configuration has been deleted from the Bell starship bar, which was found to account for as much as 30% of the total drag at 150



CLEANED-UP FRONTAL AREA of the modified research Bell UH-1B, top, is evident in comparison with standard model, below. Airframe and nose view intakes on nose fairing removed and leading edge considerably reduced in size.



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LATER VERSION of the revised UH-1B has a three-bladed rotor and will be used to further extend the helicopter's speed range. Rotor configuration will include two right and two left. Note fixed engine intake on lower portion of the forward pylon housing.

ii. Stability has not been compromised to a considerable extent, pilots report, but at higher speeds than most flyers can tolerate, stabilization will probably be necessary.

Stabilizing gear has also been successfully cleaned up, most flyers report, mainly by the flat top having been deleted. Fuel tanks have also been deleted, and the fuel line has been added to all extensions. Fuelage lines have been further cleaned up by removing the lower side during main cabin door to delete protruding tracks and mounting doors with distinct piano-type latches. Antennas and rear view mirror mounted under the nose also have been deleted.

Main Rotor Loads

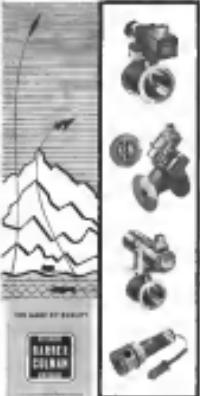
Closure progress has resulted in the aircraft UH-1B having a flat-top drag area equivalent to approximately 11 sq ft compared with more than double that for the standard production helicopter. The revised rotor blade loads are down some 45%. Variations in load have been greatly lowered, pilots report, that they are flying approximately 20 mph faster before they reach equivalent load trim levels on the standard UH-1B.

Research helicopter can match stand and UH-1B's speeds at approximately 25% lower power levels, range at same power levels is about 75% greater. Modification continue on the research machine which will need to test flying more blade sweep and rigid rotor configurations in order to provide a family of 180 UH-1 configurations with general blade geometries to be looked out to provide full rigid capability.

Next spring, stub wings of 26.7 ft. span will be added to the research UH-1B. Wings will be ground adjustable over a range 12.5 deg. to 27 deg. and rigid-rotor incidence can be varied up to 20 deg. Plans have been made to add mid-rib Contentment ATC T-9 budgetary ratings in pods on either side of the

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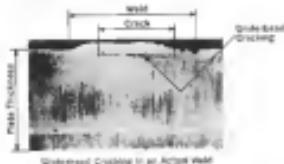
Being heat-treated constructional alloy steels, USS "T-1" Steels require different welding techniques than other high strength steels. They are not difficult to weld, just different. Strong, reliable joints are obtained when the following three precautions are followed. We invite you to read these as a guide to realizing the full benefits of USS "T-1" Steels. They are detailed in a booklet which includes a Welding Heat Input Calculator, and in our new welder training film, "How to Weld USS "T-1" Steels" (free copies).

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To be sure you have selected the correct electrodes, remember that low hydrogen coatings are designated by the last two numbers at the electrode classification as 15, 16 or 18. None other. For example, E6915, E9016, and E10016 are satisfactory for welding USS "T-1" Steels.



When you want to be positive that the finished weld will be as strong as the parent "T-1" Steel, use E11015, 16, or 18 rods.

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quired by codes and one or two other special cases.)

When welding "T-1" Steels to a lower strength steel, use low hydrogen rods of the strength level recommended for the lower strength steel.

Proper handling of electrodes is also important. When exposed to air, low hydrogen electrodes will pick up moisture which is a rich source of hydrogen. Keep your electrodes dry. Make it a practice never to open more than 30 minutes supply of rods at a time. A sure way to keep rods dry is to keep them at 250°F even if you rods have already been opened, but bake them in an oven according to the manufacturer's recommendations. One hour at 400°F is average.

To sum up Rule 1, for manual welding use low-hydrogen electrodes and keep them dry. For submerged arc or inert gas shielding arc welding, use thoroughly dry fluxes and water free shielding gases.

RULE 2—Use correct welding heat

On most kinds of structural steels, high heat input is required to get a good weld. With "T-1" Steels, the opposite is true. The best welds in "T-1" Steels depend on never getting over a certain maximum amount of heat. Less heat is better as the weld will cool quickly which in "T-1" Steels, results in good, tough welds. Thus, you must closely control the amount of heat put into the weld.

For this reason, never preheat "T-1" Steels except in special cases. Preheating means more heat to get rid of and a longer cooling off period, which can be harmful to welds in "T-1" Steels. The cases in which preheating is necessary are those in which the steel must be heated to get rid of internal residual stress (hydrogen source). Since the stress is so restrained it doesn't have room to shrink after welding, or when thick pieces over 1" are being welded. At this time, however, preheating isn't necessary, and never preheat "T-1" Steels as much as.

The heat you put into a weld depends principally on amperage and the speed at which the arc travels along the joint. The higher the amperage, the more heat input. The slower the speed, the higher the heat input. Controlling heat input requires keeping amperage below certain critical points, keeping the speed of electrode above certain speeds.

There are two other important items to keep track of: sheet thickness and temperature. Thicker sections can easily soak up more heat than thinner ones, so you can use more amps and slower speed. As for temperature, the section may have been heated up by pre-heating or by previous passes of the electrode. So if the section is already hot, you must dial down an amp or increase speed to avoid excessive heat input.

Heat Input Calculator.

There's an easy way to determine the safe heat input for USS "T-1" Steels. The circular Heat Input Calculator, which is provided with the book offered in the coupon, will let you quickly find out what amount of heat will result from any given setup, and determine how much more you can safely put in. It is a



circular "slide rule" which tells, on the front side, how much heat will be put into the joint if you know the amperage, voltage, and arc speed. On the back side of the calculator are tables showing the safe heat inputs for "T-1" Steels in several different thicknesses at different temperatures. This handy device is designed to help you get good welds every time. Heat inputs may also be calculated from this formula:

Heat Input $=$ $\frac{A \times V \times S}{100}$ $=$ Weld Seconds (Amperes)

Speed, inches per min. \times $\frac{1}{100}$ $=$ Per inch of weld

RULE 3—Use recommended welding procedure

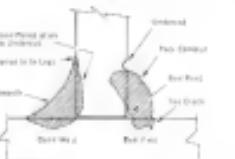
The straight-through stringer bead method is preferred for welding "T-1" Steels. Do not use the "All weave" method. Weaving leaves the metal coarse because the arc travel speed is slower and may cause excessive heat input. The proper method is to fill the groove with a succession of stringer beads.

Before a bead can be laid over an earlier bead, the flux scale, or electrode must be removed.

Back gouging. The preferred method is square gouging followed by clean-up grinding. Do not use an oxyacetylene torch. There is danger of overheating which may cause an embrittling heat tint.

Speed. Whether you control speed by machine or hand, speed it down. The Heat Input Calculator described above is your guide to the proper speed to avoid excessive heat input.

Post welding. Good fillet welding technique is more important with "T-1" Steels because the joints are usually required to withstand high stresses. When welding "T-1" Steels should be annealed, correctly case treated and well relieved in the laps of the plates to be joined. The layers of each weld should be made so that there is a good root penetration but no undercutting. The weld shown on the left is ideal, the one on the right is to be avoided.



When thick pieces are joined, and when the weld intent is to be stress relieved, fillet welds can be troublesome because of ice cracking. There are several

ways to eliminate ice cracking near fillet welds on "T-1" Steels. In the case of Tee or fillet joints where lower strength welds are often the rule, use low-hydrogen rods of the E60, E80, and E70 classes. Being lower in strength and more ductile, they are less likely to "pull cracks" at the toe of the fillet weld.

Another preventer of the weld can also be very helpful in preventing cracks, especially if the weld is to be stress relieved. Joints made even with the higher strength rods (E100, E110 and E120) should be free from ice cracks if possible. Sometimes it is necessary to open each pass, at other times, peening only the toe passes will prevent cracking. After peening the welds should be adequately ground to fair the fillet into the rest of the joint.

Other means that can prevent cracking include use of a soft wire pedestal electrode (swinging the base of the upright piece, and laying down "butter" welds in its area). The first two methods allow the upright leg to "shrink down." The "butter" weld strengthens the "T-1" Steel in the area where a toe crack may start. It is ground off prior to actual fillet welding and must be located so that the toe passes of the fillet will be laid right over the strengthened zone.

Free Welding Help. The above information is spelled out in greater detail in our free booklet "How to Weld USS "T-1" Steels." This booklet is a Heat Input Calculator that helps the welder choose the proper welding machine settings. We'll gladly pass through free copies for your shop personnel. Also, you'll find our "10 minute" color motion picture of the same name a big help in demonstrating to your welders the proper welding techniques. Both "How to Weld USS "T-1" Steels" and "How to Weld USS "T-1" Rods" are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division • National Tube Division • Tennessee Coal and Iron Division • United States Steel Supply Division • United States Steel Export Company



United States Steel, Room 8021
605 William Penn Place
Pittsburgh, Pa.

Q. Please send me _____ copies of "How to Weld USS "T-1" Steels."
Q. Also send me your 10 minute color sound movie of the same name.
I understand there is no obligation.

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ Zone: _____ State: _____





FISH TAIL AND REAR-ENGINED configuration of the Boeing 727 is exemplified in this view of the new short-haul aircraft. The aircraft is shown at an altitude of 27,000 ft (IAW Nos. 25, p. 42). Time is printed in brown and yellow color scheme, identical to the original prototype Boeing 707. Aircraft is powered by three Pratt & Whitney JT8D 1 engines each rated at 14,000 lb thrust at takeoff.

727 Designed for Low Approach Speeds

By David A. Anderson

Renton, Wash.—Engineering design goals of the Boeing 727叫for a maximum approach speed of 140 mph. This is to reduce landing approach speeds for bad-weather conditions.

Aboard to operate the airplane in and out of small fields and to fit it into medium stage length, econometricians were two other requirements that influenced the design.

The first of experimental engineers is, plus an extensive market survey that disclosed the traffic potential and therefore both the capacity and the economic line out of the 727, built a rigid frame of reference for the Boeing design.

Working within these restrictions, the engineers developed refinements of layout, design and systems that had characterized their earlier efforts in multi-jet aircraft. The result is that the 727 looks like a Boeing airplane, and in

spite of its high-mounted T-tail and three rear engines, it looks like a conventional jetliner. Only when the aircraft is viewed from the rear does the full beauty of the engineering refinements become apparent.

The airplane, which was called out of the lounge Nov. 27 (IAW Nos. 25, p. 42), is powered by three Pratt & Whitney Aircraft JT8D 1 engines each rated at 14,000 lb thrust at takeoff. Wing span is 106 ft, 7 in., and over-all length is 134 ft, 1 in. Landing can be arranged to carry 70 first-class passengers or four abreast seating in 114 seats that passengers can reorient to their liking. Maximum takeoff weight is 142,000 lb. In the configuration, the static load requirements of the Boeing 727 are being adhered to the letter. Boeing believes that all of them will be satisfied.

Boeing's philosophy in the design of the 727 sprung from operating conditions associated with the short-haul

medium-range loads demanded by the airplane. On short runs, the 727 must be capable of landing in areas of fields with about 3,000 ft of runway, at all kinds of weather and without relying on extensive approach aids. It would prove unreliable at lower altitudes, which would mean exposing the passengers and the airframe to rising winds, as well as longer periods of time than those associated with long-distance jetline operations.

The only way to approach this problem was to design a wing with high wing loadings for cruise in order to minimize the drag, and with high maximum lift coefficients in order to minimize the static load requirements of the airplane.

Boeing's design approach depends on the 727's ability to develop a high lift coefficient for the airplane which would be substantially greater than the lift coefficients obtained on the airplane's earlier transports.

Basically, the 727 wing looks like the wing of the Boeing 720 series. But the sweep angle, dihedral angle, aileron section, high-lift devices and control surfaces differ from those of the 720. Wing loading at maximum flight weight of 142,000 lb is 110.75 lb per sq ft, the same weight at 112,000 lb, the maximum landing weight of 92.75 lb. These figures are between similar values for the Boeing 720 and 720B series. Maximum landing wing loading for a weight of 151,000 lb is 79.5 lb per sq ft, considerably lighter than the 720 series.

Boeing designed and tested a large number of flap systems, involving some using boundary-layer control. All of these were tested in wind tunnels either at Boeing or in the Seattle area. Some of them were promising enough so that full-scale hardware was built and flown on the Boeing 707 prototype, the 707-300.

Flap Mechanisms

Chief 727 Project Engineer F. E. Stearns and I at one time during the development of the airplane there were 41 flap designs competing competitively, based at practical mechanisms and much-maintained structures.

The final result was that the wing was designed with trailing-edge triple slotted flap running quarterwise from the leading to the trailing edge and from the chord aftwise in the outboard ailerons.

The leading edge of the wing carries Krueger flaps in three segments from the leading to the inboard pylon, and inboard trailing-edge slotted flaps from that point out to the wingtip.

Strengths and stiffness of the wing, however, did not influence overall maximum lift coefficients of this wing, but the company has said that it shows over 40% improvement over the 720 and 707 wings. Aerial ratio of lift coefficient to drag from 0 to flap up is 1.7 for the 707 and 720, and 2.4 for the 727.

Wing span is 134 deg, measured at the quarter-chord point. Both the sweep and the dihedral angle are less than those on the 720.

Because the cruise profiles are different and because the wing is mounted on the 727, the aircraft's center of gravity demand on the static aero of the 727 wing have been changed. The inboard leading-edge extension is similar to that on the 720. Gross wing area is 1,618 sq ft.

Wing structure is basically a two spar box beam with conventional stiffeners. Strutless. Surfaces are built from an end grain stringer construction.

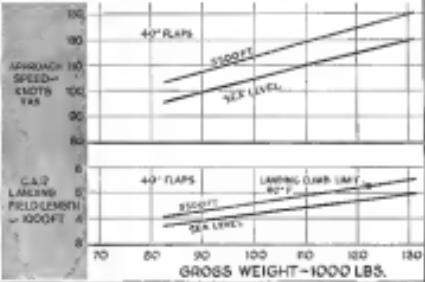
From the body out to the wingtip, the volume between the span is increased 60 in. in total, with 7,000 gal total capacity.

It was not enough to provide the



BOEING 727 THREE-VIEW drawing shows basic layout of the three-engined jet transport.

APPROACH SPEED & LANDING DIST.



APPROACH SPEED and landing distance vary by the landing effect on short routes.

727 with large lift increments for the approach and landing. They had to be able to land at 140 mph, yet be able to land with the wings level and to be stable and controllable down to its minimum lift speed and that the aeroptotic notion had to be developed using different kinds to take full advantage of the aircraft's flight characteristics.

Complete description of the aeroptotic notion is given in *Aerospace Week* (Nov. 18, '68).

Surface controls for the 727 were also an evolutionary development from the aeroptotic notion that went before. Combination of ailerons and flaps provides a safe lateral control and makes possible the directional control and the yawing is conventional. The variable hydraulic control system ac-

celerates an all three axes.

The wing leading edge, in addition to carrying the leading edge camber, carries ailerons, the leading and trailing edge, along the span-wise position on the upper surface, an inboard aileron, four outboard ailerons, and an outboard aileron.

For lateral control, two ailerons are available, five per side. Four of these are the inboard ailerons and the fifth is the most-outboard of the inboard ailerons.

The remaining two ailerons are each used for ground holding only.

The inboard ailerons are used during high-speed cruise flight only, the outboard ailerons operate only when the flap is down. The ailerons pick up airspeed when it is more than five degrees deflection of the control wheel.



The real low-down

When ground troops call for close air support [at a limited war] Republic's F-105D can deliver Hellfire-inspired air-bomb strikes, but very slow. Under enemy radar just over the trees.

F-105D is built that way. Built to slip, swap, safety, to strike again another day. Built to do it in any weather, any time.

In point accuracy, all-weather capability and intense avionics are unmatched with the F-105D. Equally automation and fully integrated via its fire, flight and navigation controls.

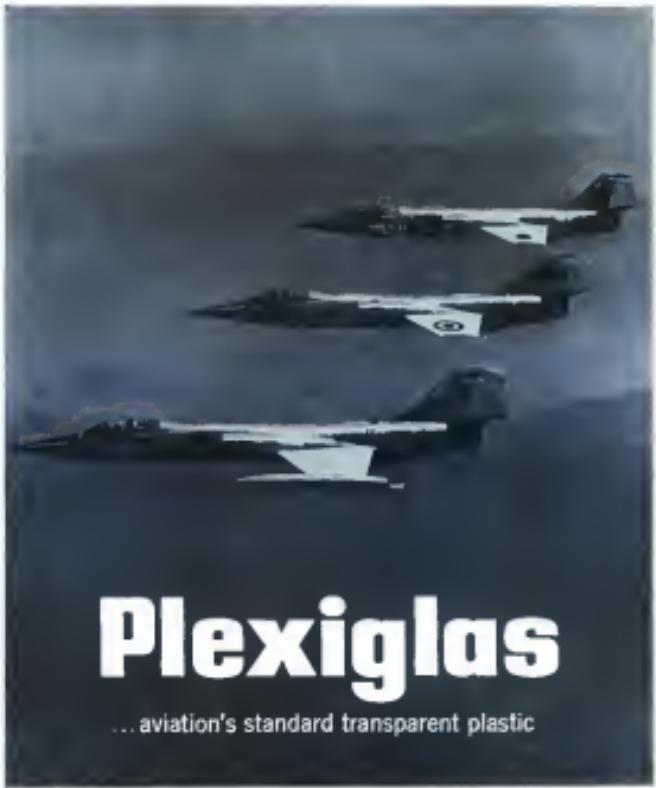
Its punch is versatile, everything from nuclear to conventional bombs, from 50-millimeter to a wide variety of missiles. Operational altitude ranges from 500 mph to above Mach 2. F-105D is a fighter and a bomber. One man does it.

F-105D works. It is flying in Europe and the Pacific with the U. S. Air Force.



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Photo courtesy of the Aircraft F-35 Joint Strike Fighter - made of PLEXIGLAS® as cockpit glass. The 1000 mph multi mission fighter is now being produced for international use in United States, Germany, Belgium, The Netherlands, Canada, Italy and Japan.

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Plexiglas is a registered trademark of Rohm and Haas Company

are positioned so that this deflect only 15 deg when the flaps are down, 30 deg when the flaps are up. Both these deflections should produce a roll rate of one radian per second. Brake spoilers deflect to 45 deg.

Slight roll can even balance this. If one rudder system should fail and produce a hard-on signal, the other rudder would deflect automatically to compensate. There are dual rate dampers set for each rudder, with authority constant in the 10 degrees on top of no rudder pedal input.

Hydraulic Systems

There are three hydraulic systems, two of these are dual parallel systems for longitudinal and lateral control, and the third is a back-up system for the rudder. First of the systems is powered by dual pumps driven by the left and center engines. It operates the aileron control and flap controls and the landing gear. Second of the systems, which operates simultaneously with the first is powered by dual electrohydraulic pumps. If one hydraulic system fails, the second supplies enough power to automatically arrest the landing gear. The third system drives the rudder, aileron control and the landing-edge flaps and is powered by a single electric motor driven pump.

If the two main hydraulic systems fail, the aileron control goes into manual, aero-servo and the aileron move down the lower center. Under these conditions, the aileron is not only usable but can be landed with manual control. The aileron system provides enough power to produce a roll rate of 30 degrees per second, and a full flap deflection for one elevator, but the F-35 cannot demonstrate a complete roll under the condition.

Stick Forces

Both lateral and longitudinal control moment produce artificial stick forces of 300°/sec² with spring. For the aileron, a 100°/sec² gives the feel of full deflection, for the rudder, the feel is 60° on the pedals.

The elevator has a hydraulic feel system, based on integrated inputs from the stick position and elevator pressure, and from dual pitch rate, electro-mechanical rate, one on each side, of the stick. Integration gives a clear representation of the current state of pitch, research by defining the form of the need and its static stability margin for an condition of flight. If one hydraulic system fails, there is no change in feel detectable by the pilot; if one system fails, the elevator feel is positioned in a spring which gives stick forces corresponding to those usually felt at 30°/sec².

The forward control stick and wind

How you can avoid three costly mistakes in the selection of a scientific or engineering computer

And the one sure way to find the computer that suits you best

Selecting a computer can be one of the most important decisions an executive can make. What any company can afford to pay for a computer, problems, and requirements for one computer can be more efficient than others.

This should lead to a careful study of available computers. And the study must include learning everything concerned with "make and buy" and contracts involving on contract availability and delivery.

For example, the best way to find the computer that best serves your needs, The Recomp line of solid state scientific and engineering computers has been found ideal for many leading companies. Perhaps it would best meet your needs. The following common mistakes may offer some guidance.

(1) "Buy the cheapest one"

Just as there is no such thing as a cheap pair of shoes, there is no "cheap" computer. Scientific problems solving computers sell from \$40,000 and up. They range from \$15,000 and up a month. But much more important than what one can afford is what a computer can do for a company.

For example, a Recomp 1000 and a Plessey 1000 computer could cost almost \$100,000 more than a lower priced computer. In a year or a given project, Recomp offers a fixed price range. The Recomp 1000 computer is ideal for small-scale engineering problems. The Recomp 1000 computer, for example, in solving a problem starts at \$2,400. A complete line of performance equipment is available for both computers.

(2) "Buy the fastest one"

Naturally speed is important. But computer operating speed is just a small part of the story. Save a few microseconds here and there and you have saved a much larger amount of time in the long run.

The Recomp 1000 is small and needs no scale computers work their savings in terms of hours... not microseconds. Recomp computers can save hours in problem solving time because they're simple to program, easy to operate and have an exceptionally large memory.

(3) "Buy specialized computer personnel"

Not always. Computer companies do demand specialized personnel to operate their computers. However, others are as simple to use that engineers can program their problems directly. This type of programming saves time and increases computer use.

One of the best companies to program and operate is Recomp. Engineers less than eight hours instruction are able to use Recomp computers profitably.

The one sure way to select a computer

The computer requirements of every company are unique. The best way to select a computer is to determine these requirements, define existing computer problems—through a computer feasibility study. This is the only way to know exactly what computer suits you and your own particular needs.

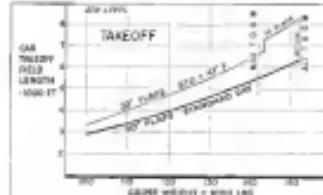
For example, start by with any comparable computer on the market. Let the facts speak for themselves. You'll see why no computer feasibility study is complete without Recomp.

We'll be glad to help you get the facts. Write today for a "Management Guide to a Computer Feasibility Study."

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TAKEOFF DATA (LEFT) DATA COMPUTED based on Civil Air Regulations 5B (CAR 5B). The data are also applicable to standard-of-oper-
ation aircraft up to 3,000 lb. above an level. Takeoff range curves (right) are based on full mixed-class payload of 28,000 lb. Gross con-
ditions specified are close to maximum cruise cruise with a large range of stage lengths.

should be identical to the units used for the 707 and 720. Because arrangement is very similar to the predecessors on planes, there are positions for captain, first officer, third crewman and two observers.

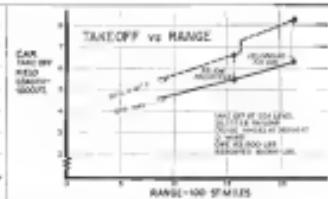
Cabin evacuation dimensions are identical to those of the 707 and 720. Standard arrangement of the ejection offered by Boeing is a mixed layout, with 15 first-class seats in front and four abreast layout in 36-in. pitch. Removable of the cabin has 66 tourist-class seats or an abreast layout in 36-in. pitch.

Door Access

From access to the cabin is by a rear left doorway, hinged directly beneath the ejection on the ground. A downward opening is optional with the ejection.

The door can be telescoped into a compartment located below the main forward seats.

There are two fully cargo compartment with a total volume of 875 cu. ft with revised gross 48-in. by 35-in. The compartments are fitted with a damage resistance material developed for the 727.



TAKEOFF vs RANGE (RIGHT) TAKEOFF range curves are based on full mixed-class payload of 28,000 lb. Gross con-
ditions specified are close to maximum cruise cruise with a large range of stage lengths.

Problems of internal and external noise reduced detailed attention during the 727 development program. Unfortu-
nately panels inside the cabin for sound absorption by means of the fabric/foam insulation, a typical approach, are not a good ap-
proach. Boeing says: "As a re-
sult of the static air in the cabin, Boeing
shows a chart of weight interference
level (which ranks the cabin which
pitches out 1000 ft) and noise levels are
below 70 dB.

On the way, the 727 will be noisier
than the 707, but quieter than the
707-120 or the 720. Actual noise level
at a 100-ft radius for the thrust reac-
tion is said to be calculated at about
71.7 dB(A).

For the instruments nose-level problem
solutions are not yet large. The
727, the company says, will be quiet-
er at a reduced range than a 707 from
parts interchangeability. In fact,
the 727 is expected to be quiet-
er than a Douglas DC-7C, 112 ft
from Boeing 707-120 or 125 ft from the
Boeing 707-200 using similar powerplants.

With the company committed to
build the first 727 as a production air-
craft rather than as a prototype, engi-
neers planned an extensive program of
tests to eliminate the risk. One example
of the work: Ground tests on eight
engines were completed in the first
few days. By the time the first 727 is
scheduled to be completed—Feb-
ruary 1964—there will be more than 20
engines running on the field, ready to
go.

Test Program

Boeing estimates that \$10 million
will be spent by the company on the
total 727 test program. It started back
in the middle of 1959 with wind tunnel
tests aimed at propulsive function and
configuration, and is scheduled to end
in September 1964 with the first
demonstration of the fatigue test aircraft.

So far the wind tunnel program time
has exceeded more than 5,100 hr of
running time, of which about 1,700 hr
was in transonic testing. Biggest
amount of time—about 900 hr—went
into development of the high-lift de-
vices. The next largest amount of time

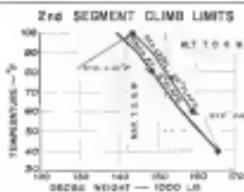


What name is on the first 1.5 Mc recorder?

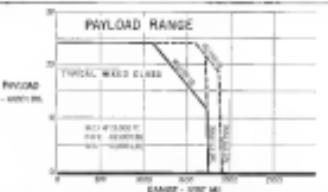
Here it is—a 1.5 Mc per track, multi-track recorder! And Ampex is the first to have it. It's called the FR 3400. It will give you the broad-
est bandwidth yet in longitudinal recording.
What's more, it utilizes solid state electronics
throughout—all in one track. It has four spools,
each electrically switchable with no adjustments needed. And it comes with tape search
and shuttle to provide quick data location and
permits any portion of the tape to run repeatedly
without operator attention. What about per-



formance? Outstanding! It offers better re-
time and minimum ringing on square waves,
low intermodulation distortion, and improved
flutter. Ampex also brings you a new 1.5 Mc
tape. In both you'll find the same engineering
precision, the same superior quality, that has
made Ampex first in the field of magnetic re-
cording. Write the only company providing re-
orders and tape for every application. Ampex
Corp., 334 Charles St., Redwood City,
Calif. Worldwide sales and service.



SECOND SEGMENT CLIMB LIMIT curve (left) shows that the 727 is not climb-limited at gross takeoff weight on a 1000-ft level of the plane over 20,000-lb. deflections on the flaps for takeoff. If climb deflection can be increased, takeoff flap deflection can be decreased and after a high climb weight. That is shown by the curve plotted for 40-degree flap deflection and an altitude of 13,000 ft. Payload-range data (right) are presented for maximum cruise flight at 15,000 lb., conditions which would probably be used on highly computerized routes where the airplane speed could be exploited.



Thiokol Research with High-Energy Oxidizers opens new

PROPELLION PATHS

TO SPACE

WHERE SIZE COUNTS...

Thiokol's pioneering looks the size barrier on solids. Continuing R&D at Thiokol has been responsible for scores of technical breakthroughs leading to production of the most reliable propulsion systems in rocketry's current catalog.

At present, Thiokol scientists are engaged in development of new super oxidizers for solids application. A



grossly enlarged microphotograph of one of three crystalline, high performance ingredients is shown in inset illustration below. Promising vastly improved performance—greater life, range, and payload delivery—an atom now flying, new Thiokol-developed oxidizers will also increase adaptability of solid systems for upper stages of space vehicles, enhanced punch and reliability of big boosters.

NUCLEAR MAGNETIC RESONANCE SPECTROMETER. Advanced scientific apparatus used to determine molecular structure of exotic fuel components for purposes of predicting their behavior.

Micro photo of high energy oxidizer.



WHERE PERFORMANCE COUNTS...

Thiokol is testing many exotic liquid fuels for space flight. Research has already achieved several new propellant combinations capable of providing missions of longer duration with greater payload capacity than other space standards and advanced cryogenics.

In actual flights of oxygen difluoride/diboron on the thrust stand, for example, Thiokol is establishing injec-

tor performance, developing ablative and other chamber cooling techniques and defining propellent system performance.

Thiokol

Rocket Operations Center: Ogden, Utah
AN EQUAL OPPORTUNITY EMPLOYER



ROCKET ROBOT. Remote-controlled device carries experimental oxidizer and "heat" propellent components from lab to test area. A speed development tool.

CHEMICAL CORPORATION
BRENTWOOD, PENN.

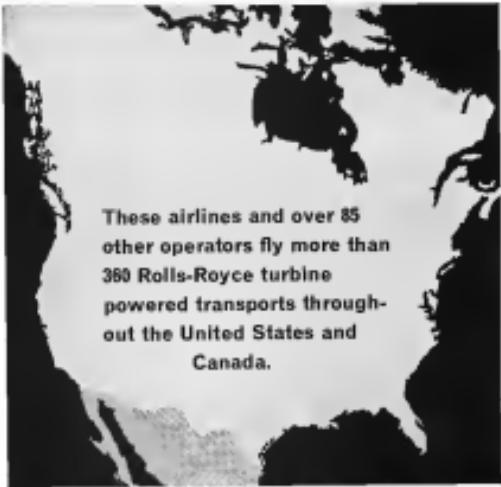
Thrust stand firing with ODF.



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Rolls-Royce turboliner, turbojet and turboprop engines are being overhauled at Dallas, Denver, Los Angeles, Milwaukee, N.J., San Francisco and Washington, D.C. in the United States, and by Rolls-Royce of Canada and operators at Montreal and Winnipeg. More than 50 Rolls-Royce field service engineers are stationed with aircraft operators across the North American Continent.

ROLLS-ROYCE OF CANADA LIMITED, 1854 EOTE DE LIESSE ROAD, MONTREAL, P.Q.
AEROTRACERS - MOTOR CARS - OILFIELD & GASOLINE ENGINES - ROCKET MOTORS - NUCLEAR PROPULSION

These airlines and over 85
other operators fly more than
360 Rolls-Royce turbine
powered transports throughout
the United States and
Canada.

Boeing 727 All-Weather Program

Boeing has proposed a three-phase program which would develop an all-weather capability for the 727 at some time in the future. Although none of the proposed approaches to the subject are finalized with the addition of airframe and aircraft photo (AVG Dec. 3 p. 40), Boeing feels optimistic that all weather flying operation will come and finally be approved by every agency or committee associated with its transport.

The basic 727 as delivered is capable of operating in reduced minimums 300 ft. ceiling and visibility only 1/2 mile visibility, the company says. It will be achieved by new training and by the improved reliability of the equipment: the improved handling characteristics of the aircraft, and by integrated instrument warning display. This operational mode is subject to approval by the Federal Aviation Agency.

Second phase, also subject to FAA approval, would take the captain further along the path of reduced visibility - 200 ft. ceiling and one-half mile visibility. Boeing proposes to add instrument compensation, glide slope, automatic systems, and autopilot control. It would also allow to have a radio altimeter, a fire extinguisher and automatic fire抑止器, and the company says the former may be included.

Finally the third phase increases acceptance all-weather operations, coming from improved situation display, track steering, redundancy of reference to prevent landing in spite of single failures, and an additional equipment using use of terrain avoid systems.

Boeing has next into flight coverage time.

Engine relays were tested on the water table, a two-dimensional facility to analyze flows which much control quantity. The first series of tests were performed studies were made in the transonic tunnel at Boeing, the low speed tunnel at the University of Washington, and at large-scale tests with an experimental JT8D engine on the ground.

Destruction Tests

Two complete airframes are earmarked for destruction. One of these will be the static test aircraft and a nose landing gear assembly in the test frame. Second is the transonic airframe, which will not be available for test until 1961.

Second production airframe will be retained by Boeing for flight tests until the first group of aircraft has been delivered. Reason is that flight testing of the 720 and 760 series has to be done prior to any airframe made available through the cooperation of customers. As defined in Boeing's part, generally meant that the incorporated test installations had to be ripped out and installed in another airframe again with the customer's assistance. This routine was the duty of the flight test department, but was necessary, according to the memorandum. The 727 program will not do the same route.

The Dash 80, serial 301 prototype which has been an eight status failure for eight years, was used as a flying test vehicle for two major areas of 727 development: engines and flaps. It logged about 250 hr. in these trials, and started service on the heavy and refresher aircraft apparently floating around the Seattle area, its large ridge flaps and leading-edge slats

fixed in place, and its four wing engines augmented by a fifth powerplant mounted like a seat on the left rear fuselage. Unconfirmed reports say the 727 stalled at less than 80 ft.

Other aircraft to be destroyed included the "can bird," a 51-mil. eng. rig with full-scale ducts and components of the aircraft's control system.

Boeing will hold to a production rate of three jet aircraft each year until 1963, and by mid-1964 will reach a scheduled eight aircraft per month. First four airframes of the line will go into the certification program, the following three complete the first batch and all of the first seven will be delivered to United Airlines.

The 727 is being fed right into the same certification program that are now taking the 720 and 760 into service. The reason remains in use of maintaining the level of employment while consistent over a long time period. Boeing believes that shifted technology, working on systems installations, or field ensemble, in flight sections, can handle one of the following airframes according to type. To them, the specific job is the important task, and the general airframe class on which they are working.

Steady Employment

The reason that by proper phasing of 727 production in the long weeks at Renton, the company can avoid the employment peaks and valleys that generally characterize the shift from one type of production to another.

One of the most important adjuncts to production has been the mockup. Traditionally relegated to a side room of a hangar somewhere, the mockup has been raised generally as a means of representing the customer. Boeing has

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'GO'
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Hughes makes news in armament!

Minor skirmish or major conflict—today's air-to-surface tactical missions require new flexibility in armament. There are a greater variety of small, hard-to-see targets which must be attacked at short range from aircraft flying at low altitudes. Total time to fire is shorter.

The optimum weapon in this difficult environment is the high-rate-of-fire gun. It is extremely accurate. It retracts instantly. It has high lethality against a wide range of targets. Other advantages are low cost, logistic savings, over-all simplicity and reduced pilot exposure.

Gun Ordinance has been a major activity of the Hughes Tool Company—Aircraft Division for more than twenty years. This continuing gun development and production capability has culminated in advanced weapons—ideally suited for today's requirements.

Hughes gun ordnance capability includes the complete system—the gun, its installation, controls, gunsite and specialized armament. These systems are tailored to the individual missions of fixed wing aircraft, helicopters and ground vehicles.



Hughes HIFEG—30mm gun pod—Unique in the field of external armament stores, HIFEG is a complete, high performance gun system. Its Mark 11 gun fires 4000 rounds per minute—the highest fire-rate ever per pound of gun. It retracts instantly. It has high lethality against a wide range of targets. Other advantages are low cost, logistic savings, over-all simplicity and reduced pilot exposure.



Hughes Heligun—4000 round grenade launcher at only 38 lbs. weight—seven times more firepower per gun than current weapons. Developed for use from the Hughes gunship, the Heligun is preloaded. Hughes' new Heligun utilizes multiple projectiles per round in a 20mm counter-rotating HIFEG. Firing the 70mm NATO round, the Heligun will provide dense firepower from helicopters, fixed wing aircraft or ground vehicles. Features include: Self power, instantaneous rate. Low frontal area. Positive protection from cockpit. Low profile and double feed. Instantaneous cartridge change, low velocity rounds feed from standard M13 links and only 180 lbs. average recoil.

Helicopter Armament System—Hughes gun pod—designed for LOCH—can also be easily adapted for other helicopters. One pod can fire a pair of M60 machine guns and adjust elevation, control, quick retraction, low drag, spread gun sight. Alternatively, the new Hughes Heligun could replace existing guns to offer a powerful increase in firepower and a five times reduction in drag. A fixed wing version would position the Heligun in an external pod. An interchangeable package contains the XM-73 grenade launcher.

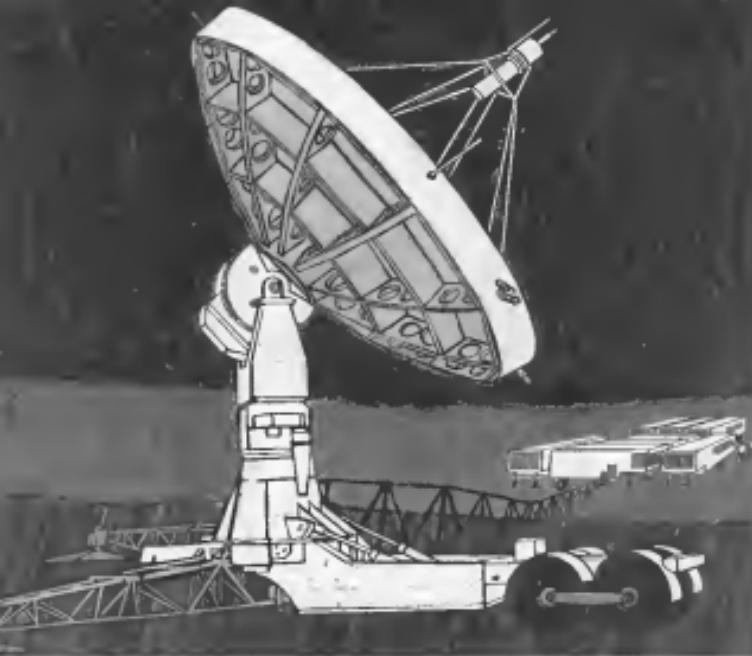


Hughes ammunition developments include 20mm smoke-piercing rounds, specialized for use against ground targets delivered from fixed wing aircraft, helicopters and ground vehicles. Also in development, a new 20mm air-to-surface round for the MK 11 gun against small targets.

4 Hughes HIFEG 30mm Pod with MK 11 Gun (4000 rounds per minute fire-rate) gives the Navy's AID missions effectiveness against small targets such as tanks and other ground vehicles.

Twenty years of experience applied to expansion of the state of the art... complete engineering know-how, enclosed firing ranges and testing armament in one compact facility. These are the factors which have made Hughes unique as a producer of advanced armament for free world defense. Individuals with a need-to-know are invited to request further information. Please contact the Vice President-Marketing, HUGHES TOOL COMPANY, Aircraft Division, Culver City, California.





The SYNCOM ground terminal story. It is a moving one.

The syncom experimental satellite will employ surface terminals that have no permanent location. They can be moved as often as necessary. That's a unique feature about Project syncom. It's our job to design and construct the mobile ground facilities under contract to the U.S. Army Electronics Research and Development Laboratory.

Bendix Radio's participation in Project syncom—a NASA program in which the U.S. Army Satellite Communications Agency has responsibility for surface terminals and communications testing—is a typical example of our capability in the fast, moving communications field. Bendix Radio's experience and performance in developing equipment for fixed ground stations and shipboard terminals for the military communications satellite program helped lead

to our selection by the Army to participate as a prime contractor in the NASA syncom project. Project syncom is to demonstrate the feasibility of communications between surface stations via a lightweight satellite in a 3-hour synchronous orbit at the 22,300 mile high altitude.

The in-orbit ground stations in some respects represent a state-of-the-art Super High Frequency equipment development. This development also provides basic and building blocks for consideration in other advanced Government-sponsored programs.

To take advantage of our experience and minimize development costs in communications systems by contacting Government Sales, Bendix Radio Division, The Bendix Corporation, Baltimore 4, Maryland.

Bendix Radio Division



Despite radical changes from predecessors, including rear mounting of engines and a different wing, the Boeing 727 retains traditional Boeing looks. A total of 131 aircraft have been ordered by seven airlines.



Integral vented landing gear will open into one section of the three-engine, short-haul aircraft range aircraft. Forward door, which can be equipped with integral loading ports, opens into fast class compartment.

*7,000 gal. titanium tank
for liquid hydrogen
built by Beech Aircraft*

Data now available on [Titanium's] cryogenic properties

Titanium can hold more liquid hydrogen at less tank weight than any other material and still give you impermeability to hydrogen, enormous elongation and notch toughness at -423°F .

Some specifics. The liquid hydrogen tank shown here was built and successfully hydrostatically tested by Beech Aircraft Corp. Capacity: 7,000 gallons. It was fabricated from sheet supplied by Titanium Metals Corporation of America to less than ASME tolerances, in thicknesses ranging from 0.014 to 0.025 inches.

Titanium alloys. The alloy used was Ti-6Al-4V ELI, one of two alloy grades advanced by TMCA specifically for liquid hydrogen service. The other grade is Ti-5Al-2.5% B1. The designation ELI stands for Extra-Low Impurities. Typical properties of these grades at -423°F .

Ti-6Al-4V ELI: tensile strength, 263 ksi, yield strength, 248 ksi, notch tensile strength, 211 ksi elongation, 7%.

Ti-5Al-2.5% ELI: tensile strength, 229 ksi, yield strength, 206 ksi, notched tensile strength, 233 ksi, elongation, 15%. Compare these properties with titanium and aluminum. You'll see why titanium guarantees more payload!

Then contact TMCA, the nation's only firm devoted exclusively to titanium and the only company providing the full-time, comprehensive technical service you require. Phone, write or wire TMCA for cryogenic data today.



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REVIEW 035040-19601-1000-107000



Piasecki 16H helicopter is currently being tested with wings in combination with rotor system. Addition of wings allows the vehicle added speed, range and stability. Note USAF 8470 in lower background at Philadelphia International Airport.

Piasecki 16H Tested in Wing-Rotor Combination

Powered by 2 Canadian Pratt & Whitney PT6 turbines, 500+ shaft horsepower counter-rotate four-blade main rotor and provides propulsive lifting force in phase. 16H has five seats. Shown below, vehicle has rotor folded and wings folded in parking configuration.





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DC-8's are the first pure jet freighters. And they carry cargo at fastest speed and lowest cost per ton mile in aviation history.

C-133s are the only transports that can swallow ICBMs whole, cutting days from trips between manufacturing and launch sites.

C-141s are the mainstays of our military global supply system, did yeoman work in New Year deliveries, supplied the South Pole, served as flying hospitals during the Korean conflict.

DC-7's play a major role in air/sea freight operations.

C-119s and C-54s were the Air Force's workhorses during the Berlin Airlift... showed the

dependability built into Douglas transports.

DC-6As were the first to break through the high cost barrier to the expansion of air freight.

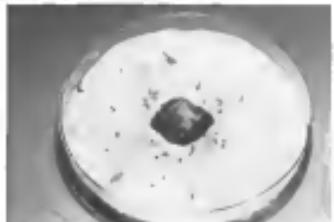
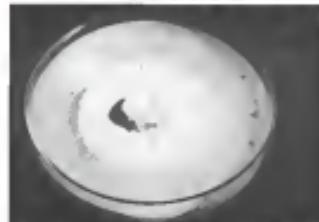
C-47s were the mainstays of our World War II military supply effort, flew "the hump" regularly to keep our life lines to the Far East open.

DC-3s are characteristic of what can be expected of all Douglas transports... more than 3500 commercial and military versions are still flying after 25 years of rugged service.

It all adds up to this conclusion: for transports that perform better, last longer, maintain easier, and stay in there when the going is roughest, you can depend on Douglas.

DOUGLAS BUILDS GREAT TRANSPORTS


DOUGLAS AIRCRAFT DIVISION



VARIOUS FUNGI STUDIED BY APCO'S RAD Division include *penicillium*, above left, *aspergillus*, above right and *mucor*, below left. Below right is a culture of *penicillium* photographed by its own light. Photo was a three-hour exposure with No. 105-MP spectrographic Ektar. Magnification is four times.



Fungus Is Studied as Radiation Detector



LIGHT TIGHT BOX, left, holds bioluminescent fungi and photomultiplier tube. Signal from tube is amplified and recorded on the monitor at right.

Certain types of fungus may be used by future space pilots to indicate radiation levels within their spacecraft, just as miners use canaries to detect gas in mine shafts, if research now under way at Apollo Corp. should prove the concept to be feasible.

Using two species of fungus—*penicillium* and *aspergillus*—as the element part of the sensitive energy of radiation via bioluminescent light, Arthur L. Avrett, Research and Advanced Development (RAD) Division, Washington, D.C., is attempting to evaluate the effects of such factors as radiation, temperature, shock, vibration, acceleration, sound, postal pressure, oxygen and gas concentration on the bioluminescence of these simple plants. Efforts are also under way to measure the biomass of the plants, which is detected by sensitive photomultiplier tubes.

Earlier applications of the fungi,

FOR BLUE SKY THINKERS IN ELECTRONICS... In electronics, planning for the future in space, communications and national defense calls for a liberal measure of practicality and imagination. ■ The air dielectric coaxial cable systems and related microwave equipment engineered by Phelps Dodge combine capability of operation with almost unlimited applicational values. They have played strategic roles in spelling up and materially advancing the microwave art in missile launching and tracking, radio astronomy, radar detection and atomic energy instrumentation. ■ These complete Phelps Dodge rigid and coaxial cable systems—based on Styroflex®, Helical Membrane, Specflex, Foarmflex and Corr-O-Flex cables, together with related connectors, delay lines, waveguides, TV plumbing and accessories—have earned the enthusiastic approval of electronic engineers in a wide variety of critical systems designs. Perhaps they can help you pluck a new idea out of the blue.

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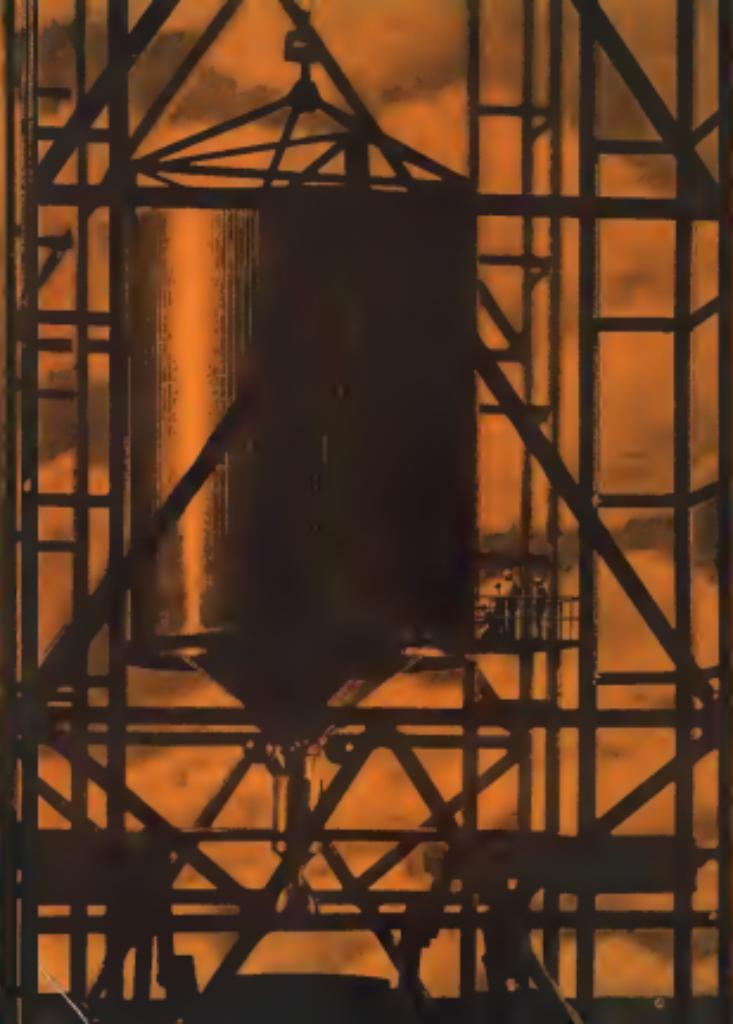
The giant RIFT vehicle:

it will pioneer nuclear-propelled space flight

To propel its space ships through the far reaches of the solar system, the National Aeronautics and Space Administration is studying new kinds of power. NASA feels that nuclear propulsion may be the key to space exploration. It has chosen Lockheed Missiles & Space Company to design and build the nuclear stage of the giant vehicle that will demonstrate the feasibility of nuclear-propelled space flight. As NASA's industrial partner, Lockheed shares the management, scientific, and technical responsibility for the RIFT (Reactor-In-Flight-Test) program. The primary purpose of the RIFT vehicle is R & D. It will help the NASA/Lockheed team develop design data for even more advanced nuclear-stage systems. Yet so great is its promise that Lockheed is designing it for possible use as a stage stopper - a large nuclear booster - the 715-million-pound-thrust Advanced Saturn.

LOCKHEED MISSILES & SPACE COMPANY

Photographed in realistic settings, scale models of the RIFT vehicle illustrate exactly how the Lockheed-built nuclear stage will be static tested at NASA's Neutral Buoyancy Development Facility, Jacumba Point, Baja California, Mexico. From it would be deployed with more crew, using the Advanced Saturn booster.





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The LGP-30 is an unfair competitor. No other computer in its class even comes close. □ You can't find another computer with a memory this large (4096 words—2000 more than the nearest competitor) at such low cost. □ Ease of operation and programming? Even non-technical personnel can master it. You can learn to program the LGP-30 in hours and free yourself from dependence upon computer programming specialists. □ Mobile? Completely. It can be used by any number of people in any number of places and departments. Just plug it into conventional outlet. No expensive installation. □ Bonus! The readily available Program Library for the LGP-30 will undoubtedly include the programs you need—and save you a small fortune. It's the most extensive Program Library in this computer class—and covers problems in gas, oil, and electrical transmission, civil, highway, and structural engineering, product design, chemical and paint manufacturing, metal and mineral processing and many more. □ If you require a larger computing system, take a look at



the LGP-30's big sister (or brother)—the RPC-400. Completely transistorized, 8008 word memory, computing speeds us to 230,000 operations per minute. It's the desk-size computer with room-size computer capacity. For more information about rental or purchase, write Commercial Computer Division.



 **GENERAL
PRECISION**

COMMERCIAL COMPUTER DIVISION / GENERAL PRECISION, INC. / BURBANK, CALIFORNIA

Area selection letters probably would be in an X-ray detector for unusual spacecraft designs originally designed a little more than 10 years ago, with since operations you hardly expect, is Area 4. For the past year, the work has been reported by the National Aeronautics and Space Administration's Office of Life Sciences and has tended to concentrate on the two species listed previously.

Intensive Research

Thus, two types of fungi were selected for more intensive research when it was determined that the poison spores expressed 100% kill or no reaction (at 25°C) of the two most common bacteria species. It is from the intensive studies of these two types of fungi that Area scientists believe that an optimum diameter design would incorporate both types, with the smaller serving as the sensing element and the larger as a shield.

Experiments at Astro-RAFT's Wadsworth Laboratories have been conducted in light-tight chambers with the fungi grown on agar media on Petri dishes. Photoautotrophic exposure to sunlight between 360 and 700 nm wavelength was suspended 4 cm above the dishes. Exposure spectrum of the fungi between 470 and 540 nm wavelength was 50%.

Ultraviolet light at all wavelengths was applied to both the pores and insulation layers. Ammonia was introduced to test light in short exposures to the extent of applied sunlight, with exposure to pre-insulation levels usually within 3 hr. These reacted slightly to ultraviolet exposure, but that at 25°C ultraviolet.

Little Reaction

In all other test-shield, insulation, ammonia, etc.—the ammonia reacted with light intensity variations anywhere from 100 to 1,000% of sun and still remained. The pores displayed very little reaction.

Exposure of the pores to X-ray dosage between 100 and 5,000 rads gave increased a sharp rise in heat output, followed by a series of rises and drops, with eventual recovery within 12 hr after radiation. Ammonia has not yet been subjected to X-rays, but Area hopes to extend its records to cover this area as well as others—such as ionized solar radiation.

Fungi also displayed a propensity in the strength of their light emission, reaching a high point between 6 and 9 pm and a low point between 12 and 14 pm, with a light intensity of 10% of light intensity at about 10:00. The porous, aqueous, powdered water all tests and Area scientists believe that the photomicrograph could be used in a timing system aboard spacecraft.

3 Benefits That Command and Justify Value Analysis



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EXPOSED INSULATION INSULATED LIFE ECONOMY & QUALITY



Strength under static load in excess of 1000 lb/in.², strength under 100% static load and 100% dynamic load for 1000 cycles at 1000 rpm. The unique continuous surface and smooth surface insulation are the best protection for insulation.



Internal seal strength greater than 1000 lb/in.² static load and 100% dynamic load for 1000 cycles at 1000 rpm. The unique continuous surface and smooth surface insulation are the best protection for insulation.



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For more information on this and other GITS seals for your copy of GITS' new Seal Design and Specification Kit, GITS MFG. MTS. CO., 3165 KELLOGG AVE., CHICAGO 22, ILLINOIS.

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MICRO SWITCH Precision Switches

**VERSATILITY
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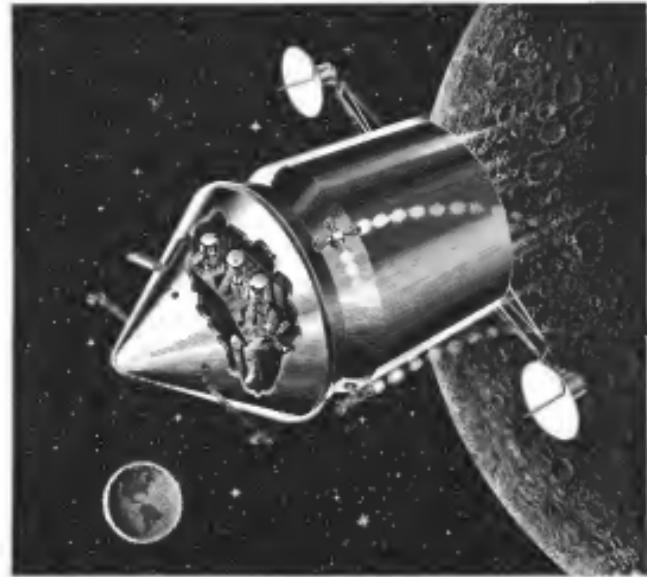
The "AT" Toggle Switch Assemblies illustrated here are just a few of more than 100 assemblies designed specifically from one to a dozen miniature precision snap-action switches. This Series provides a broad range of circuit combinations in electronic, aircraft, mobile and marine applications where reliability and panel space economy are essential.

In the Series are 2 and 3 position toggles, momentary

and momentary lever positions, pull-to-lock levers, sealed levers, and special features such as an "electro-mechanical" unit and "dry circuit" capabilities. All are manufactured with **MICRO SWITCH** precision—the precision that means long life and reliability. For engineering service book for our Branch Office in the Yellow Pages. Or, write for Catalog 73.



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IN AEROSPACE, MARQUARDT MEANS...

Reaction control engines for Project Apollo

Marquardt is currently engaged in the development and fabrication of the reaction control rocket engines for the service module of the Project Apollo Spacecraft. The National Aeronautics and Space Administration's latest manned expedition to the moon. The Marquardt engines in the service module are part of the flight and stabilization control system, providing attitude control and stabilization relative to the moon and back, and during lunar and earth orbit.

Marquardt has successfully designed and built advanced control systems for aerospace vehicles for nearly two decades. Absolute reliability and precise accuracy are necessary for satellite orientation, station keeping, orbit control, landing and lift-off from distant planets. Reaction control

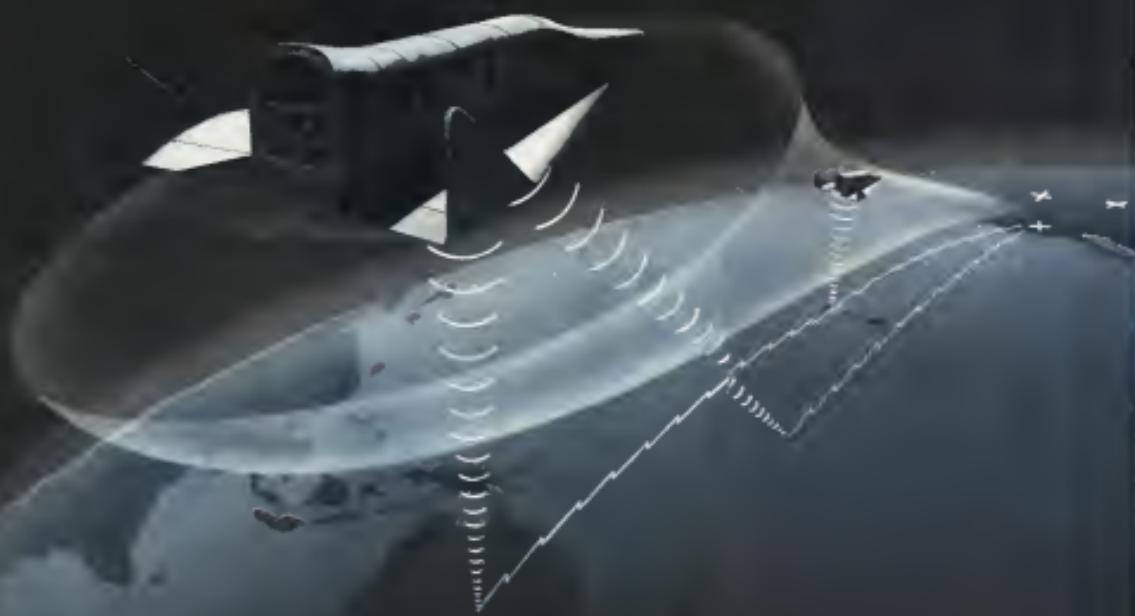
systems by The Marquardt Corporation are relied on to do these vital jobs.

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How do you guide a manned, maneuverable reentry vehicle to a routine landing . . . from 200 miles up, 10,000 miles out?

What are the basic system requirements, the operational concepts of a Recovery Control Center? What limits and tolerances will exist for each stage of the recovery process: free-fall, hypersonic flight, terminal approach, etc.? What are the flight parameters, the human factors? What is needed in the way of vehicle energy management, ground guidance, range instrumentation, data processing, data handling, display, communications, trajectory analysis, information flow analysis?

For over three years a Raytheon team led by R. L. Schroeder and John Zvara has been investigating these and other recovery problems. Primary emphasis has been placed on NASA's Gemini and Apollo, USAF's X-20 (Dyna-Soar), SLOMAR, and recoverable booster programs.

Results: A unique conceptual technique capability. Understanding of what must be done to make a Recovery Control System work. Albeit experience in real-time data processing and display, communications, and hypersonic vehicle guidance.

Schroeder, Zvara and other Raytheon scientists have published many technical articles on recovery control requirements, problems and concepts. We have collected a number of these and bound them under a single cover. If you would like a copy of this comprehensive document on system requirements for manned space vehicle recovery, write: M. B. Curran, Dept. GM 13-68, Raytheon Co., Lexington 75, Massachusetts.



Raytheon's John Zvara (left) and R. L. Schroeder

RAYTHEON



 Modular design for
10-second circuit replacement...

Terminal bases snap on and off the supporting rail. Any circuit can be removed, replaced or added, using two standard tools, in only 10 seconds. No other circuits are disturbed. No need to disassemble the entire block.

JOYBLOCKS are compact and lightweight, too, saving 75% in space and 55% in weight compared with conventional blocks. They're rugged and durable—built to withstand the stresses and strains of flight.

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ELECTRICAL PRODUCTS DEPARTMENT

\$775 million, roughly 50% more than the annual sales of all semiconductor components by American manufacturers last year—13 years after the invention of the transistor. This figure comes favorably with figures cited by Robert C. Spangler (AW Mar 18, p 28) at the National Electronics Components Conference when he estimated a \$405 million market in 1967 doubling by 1972.

Active substrate availability, according to these proportions, will account for the largest share, of the \$775 million market approximately 5680 million in weight at 15% This estimate corresponds qualitatively, as far as the percentage breakdown is concerned, with the range of many equipment and materials manufacturers surveyed, notably that year (IAW, Mar. 19 p 55), who indicated they believed that materials availability would be essentially a nonrestrictive factor.

Markus Brinkmann

Then this market would be larger than those allotted to power electronic assemblies if they would be added in kind realizations on above mentioned. This is not realistic, though, in that the figures above the hybrid devices using a semiconductor substrate. In the case of power electronic market, currently, category by definition. The hybrid that inclusion of existing active elements on passive substrates would truly reduced variability in this decade, apparently, has been ruled out.

Breakdown for the three types of registered companies according to their end market for 1970 is as follows:

Consequently, our sales (discrete components) macroscopically

- Consumers—52 million
 - Passive television audiences (from 50m)

- Military—\$511 million
- Industrial—\$18 million
- Consumer—\$10 million

Active substrate assemblies (unconducted microcircuits)

- Military—\$518 million
- Industrial—\$230 million
- Consumer—\$141 million

If these figures are an adequate proportion of the approximate percentage breakdown of the market among the three general end market categories, the military market, as expected, would be the largest single one, accounting for 48% of the total.

Of the total 1978 military electronic market reportedly projected by SRI, NASA's requirements account for a sizable portion—28.8% or \$3.3 of \$11.1 billion. Other sources in billions of dollars include: aircraft, \$6.6; aviation, 1.6;

POWER SYSTEMS BY TAPCO—Basic materials and components research combined with the development and testing of more than twenty different energy-conversion systems and the production of several thousand flight-worthy units provide the background for another unique system from TAPCO.

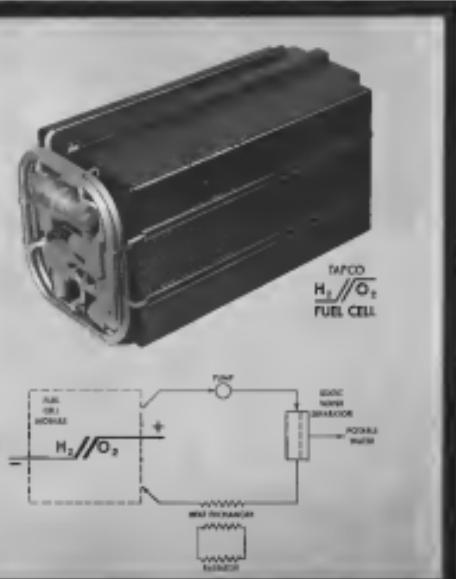
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CONVERSION METHODS

Turbogenerator
Turbohydraulic
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HYDROGEN-GEIGER FUEL-CELL POWER SYSTEM. Now under intensive development at TAPOO, a man-rated, self-contained system for manned and unmanned space vehicles. Warmed to 202° F., operating temperature provides the versatility for orbital or lunar displacement operation. System consists of compact (18.5 cu. ft.) lightweight, 1.8 kW modules housed within a unit which starts up at 90% full power. Low pressure oxygen is supplied to the fuel cell.

ration and 50%–70% efficiency. Each module contains fuel gas burner fuel cells, manifolds, controls, heat exchangers and static potable water separators. Featured in the design are high current density with high cell voltage, reliability and long life. Freedom from problems of voltage fluctuation and membrane deterioration via TAPCO, a division of Thompson Woodhouse Inc., 23555 Rosedale Ave., Chatsworth, CA 91311.

TARGET: Operation Leapfrog

Today, our target is the moon. Should we approach this mission on the limited basis of marginal propulsive power? Or should the solution of each current mission be founded on a propulsive system so readily expandable that we can, in the very next breath, leapfrog past Diana—and land on Mars? Capabilities and competence exist now to do just that.

3

Concept: New and daring. Based on the earlier assembly of high-energy solid propellants, and the high mass ratios possible with Spacelab® glass filament-wound structures.

UNLIMITED POTENTIAL.

This is a concept for producing boosters of virtually unlimited size and thrust. One, for example, which, utilizing 10 million pounds of solid propellant in 900 sectors, would develop a thrust of 25 million pounds—enough to put 300 tons in low-Earth orbit, or to boost a manned expedition to Mars and back.

RESUMO, FAZENDO PESQUISA

A product of Hercules organization, the concept draws on existing facilities of many producers throughout the nation. Propellant is manufactured at present with cast sections limited in size only by transportability. Sections are dimensioned to the assembly site and stacked in position.

FAIR DEVELOPMENT

Assembly is complicated when the relatively fragile glass filament is wrapped around the stacked projectile. This operation, too, calls for standard procedures — requiring only a basic mechanical motion. Its adaptability to explosive boosters such as this — 150 feet by 35 feet — is merely a matter of development at the launch site.

期初余额 549,391

For those who believe, as Hercules does, that the space shuttle is partly and simply a threat since we have compiled considerable documentation of our concept and its proposed programming. For details, write: Chemical Production Division, Hercules Powder Company, 850 Market Street, Wilmington 99, Del.

diaphasic component 0.5 between stations 1 and 3 and 0.4

About 25% of all military active element groups will be using integrated transports by 1970. The study is underway to determine the active element groups that might not be a major user or user with associated groups of passive users.

Ford Motorcar

These motions issued from a preference for this as a more efficient technique to the belief that active element substitution would not progress as rapidly as they have in the past two years. A number are known to anticipate paralleling the active substitution with active element definition in these and than a house tailor depositing the present components in their particular result.

Impact of integrated components on the electronic industry will be felt more strongly in the second half of this decade than it will in the first, Kurnell points out. SEMI's study indicates, he explains, that the most rapid growth in integrated components will occur in the 1980s, despite the optimistic sales estimates for the next several years. Growth is predicted by industry repre-

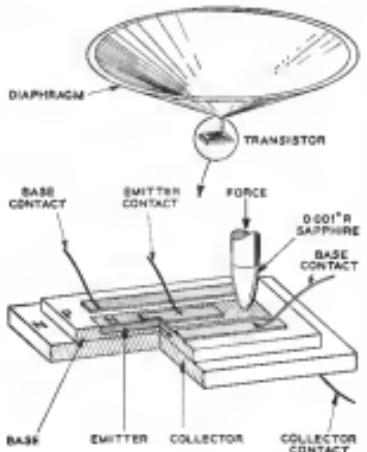
Digital field will be a principal application area of integrated circuits, the report indicates. Digital applications are large numbers of small types of circuits, in which passive element requirements need not be tight. This is particularly有利 to active resistors, and the possibility of quantity mass production increased yield and reduced prices. Active electronic interconnects' particular suitability for digital applications, the study is reported to suggest, makes the possibility that circuitry capable of reprogramming could be synthesized in sound, after that layer form.

Comments from

Because of integrated components and the general trend in the component business, capacity in the passive component manufacturer whose market will be captured in both active and passive substrate assembly markets, secular price declines in associated test or probe test fixtures (AW Mar 9, p. 15), SKK estimates that \$100 million will be shaved from the sales of both resistor and capacitor sales projected for 1978 if they are staged out by one

SEMICONDUCTOR microcircuits are expected to have the largest share of microcircuit market in 1979 with 57.51% (A), followed by thin film microcircuits (B) with 17.91% and discrete component microcircuits (C) with 6.71%, according to second study of the industry.





Bell Develops Semiconductor Microphone

Semiconductor microphones, more than five times as sensitive as carbon type and using only 1 milliwatt of power, have been developed by Bell Telephone Laboratories based on piezoelectric property of semiconductor. Diaphragm vibrations are transduced to this position of transistor by sapphire diaphragm. Device has a signal/noise ratio of 54 db at 1000 cps, pressure of one dyne/cm² at a frequency of 1 kc. Device can run open at 1000 hours at 100° C. Bell Telephone Laboratories, Murray Hill, New York.

ability, number of different gauges, etc., photographs \$150 million and manufacturing \$370 million.

As for the validity of the market projection, projected by the study, Bell Telephone has confidence in the estimates of market at the end of the decade than in those at mid-decade, for which market has already been established.

Factors acting to cut that are of concern to potential users of integrated circuit devices include the displacement of vacuum tubes, the displacement of magnetic components, the reduction in cost over conventional components and packaging techniques, as integrated component advocates have repeatedly claimed.

Factors acting to cut that are of concern to potential users of integrated circuit devices include the displacement of vacuum tubes, the reduction in cost over conventional components and packaging techniques, as integrated component advocates have repeatedly claimed.

Survey Team

Four SRI staff members arrived on a part-time basis to offices, conducted the survey. They collected data from component manufacturers, long associates of electronic equipment, from research and development organizations and from industrial associations. Data summaries were compiled in the survey and the study was, indeed, based on the counsel of scientists at the institutions who have been engaged in integrated component research and development for many years.

CAREER OPPORTUNITIES IN THE 5 AREAS OF DALMO VICTOR SYSTEM CAPABILITIES

The experienced personnel at the center have many challenges. Do you think your contributions to these areas represent unique career opportunities in many of Victor, Imagine and other

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2 AIRCRAFT RADAR SYSTEMS Mobile ground-based command and control including probe tracking and communication for wireless mobile data links. Imagine's Dalmo Victor has the unique ability of producing complete systems, from basic design to execution.

3 MICROWAVE SYSTEMS Dalmo Victor has been fully committed to microwave systems for many years. Leadership has been established in telemetry, synthetic tracking, communications, and distance measuring with experience for satellite communications and ground-based communications.

4 MAGNETIC SYSTEMS Another Dalmo Victor achievement area, Imagine's magnetic systems include magnetic navigation and underwater warfare systems, force vehicle guidance and satellite control systems, and other contributions in magnetically and in electric fields.

5 GROUND SUPPORT EQUIPMENT In partnership with Cutler-Hammer, in Milwaukee, and the Thermo Company, Dalmo Victor supplies a wide range of ground support equipment and ground equipment equipment. From a highly effective combination of Milwaukee and Atlanta, Dalmo Victor provides important single source responsibility.

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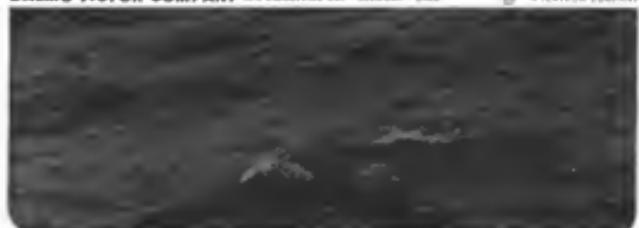
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DALMO VICTOR EXTENDS NAVY'S "SEE" AT SEA "Rotodome" antenna system, a Dalmo Victor development, is a key factor in the early warning system that gives the fleet increased threat detection and weapon deployment. The "Rotodome" antenna structure combines aerodynamics, plastics, microstrip and mechanical design concepts into a single unit which is an integral part of the carrier-based Grumman Hawkeye. This super-sensitive, long-range detection equipment is another example of Dalmo Victor's fully integrated systems capability. Dalmo Victor is in the vanguard of new developments in its major product areas. If you are interested in becoming a part of these challenging programs, Dalmo Victor is currently inviting applications from qualified scientists and engineers. For further information contact: Director, Scientific and Engineering Personnel, An Equal Opportunity Employer.



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strength steel plate with 2" thick hemispherical ends. All walls are X-rayed and tank is stress relieved and factory tested at 50% above rated pressure of 495 pounds per square inch. Finally, it is cleaned for oxygen service, sealed and shipped ready for installation.

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Plants and Offices in 23 Cities in 8 States

New Material Laser Operated Continuously

Continuous operation of the narrow beam laser has made possible a new technique in the field of electron beam welding. The beam has been recognized by International Business Machines Corp.

The firm's Tom P. J. Witten, Jr. has achieved infrared radiation output power levels of 10 to 25 watts with applied power of 90 mW. The power of 90 mW, but not all of the emitted radiation, was coherent—the characteristic of a laser. Radiation was produced at a wavelength of 8,669 angstroms using a diode laser, of 100 microns per square centimeter about 1% of the incident beam, in the manner of a pulsed electron-beam laser (AVF Nov 19, '69).

The Massachusetts Institute of Technology Lincoln Laboratory, which first reported interest induced emission from a gallium arsenide diode, and Bell Telephone Laboratories, which holds the basic laser patent, are both expected to report advances in the new type of semiconductor diode in the near future.



Mobile Tracking Lab

Mobile infrared tracking equipment is being designed by Baert Engineering Co. in Berlin, West Germany. The mobile tracking system, developed for NASA, can be used to obtain infrared tracking data on aircraft or ground vehicles. The mobile laboratory includes anemometer, infrared radar, lidar, target plus camera for monitoring infrared radiation.

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We're confident that you can't make our Chronometric motor 100% accurate. We trust. We need low voltage. We varied load. We receive constant rpm's every time. The A. W. Haydon Company's Chronometrically governed DC timing motor, 13501 will deliver 0 to 0.4 rpm at torque at 2000 rpm, accurate to $\pm 0.5\%$ over a range of 24-30 volt. It will do this for at least 2000 hours! 13501 weighs only 5 oz., will take ambient temperatures from -55°C to $+180^\circ\text{C}$, vibration from 5-2000 cps at 200 shock at 100g for 11x1 milliseconds, and draw 4 watts maximum. If acceleration, if necessary, may be done quickly to $\pm 0.2\%$ with a 60 cps sine wave 21" long by 21" diameter. This is a mighty motor indeed. Mighty accurate. Mighty reliable. Mighty. The A. W. Haydon Company for ordering information and test procedure booklet SP-24, or see your nearest A. W. Haydon sales representative.



► Union Carbide Buys Laser Assembly—Union Carbide Corp. is purchasing the Applied Physics Laboratory of Quantatronics, Inc., from Allied Chemical Corp., closing another of a series of acquisitions by the two companies. The transaction, which was first reported by Aviation Week (AW July 18, p 24), will be completed in December. The laboratory will be set up as a Union Carbide affiliate, to be called Koral Corp., headed by Dr Theodore Matisse, who was in charge of laser activities at Quantatronics. Dr E. L. McDowell, formerly with Union Carbide, will be vice president. The new company will concentrate in laser materials, a continuing high priority later development, laser applications, and engineering. Koral is expected to continue about \$100,000 in government R&D laser contracts. It will share ownership of the Quantum Electronics in Santa Monica, Calif., with the latter's microwave group which is expected to vacate the premises at a future date.

► GE to Develop Nuclear Altimeter—General Electric's Avionics & Control Systems Division, Glaston, Calif., N. Y., will develop line-of-sight altimeter which uses ultrahigh-speed photodetectors to measure the time of flight of a laser beam to and from a nuclear counter on the aircraft. Work is sponsored by USAF's Avionics Research Division. Dividends under a \$14,000 contract.

► The Rapport to Watch—Precision pen-beam radar, under development by Rapport for Avco Faise to measure radar signatures of re-entry bodies, is reported to be able to track objects as small as a basketball at a distance of 1,000 m. Known as RAMPAIR, under advanced measurements program for analysis of re-entry techniques, the radar will use a 60-ft dish and have a peak power of 100 watts. High speed tracking and data processing units will permit radar to track 100 targets in one pass around Earth. Avco Faise, a Division of General Dynamics, is sponsoring development under contract expected to total about \$4.3 million.

► LFE Develops New Type Parameteric Noise diode of low-noise parametric amplifier using multiple reflector switch which enables it to amplify at signal frequency, considerably higher than pump frequency, has been reported by Laboratories for Electronics, Inc., Boston. Technique opens the way to operating parametric amplifiers at extremely high microwave frequencies. Diamagnetic model amplifies at 18 GHz using pump frequency of 7.2 GHz, and at 11.1 GHz using a pump frequency of 9.6 GHz. Noise level in pro-

gram is to obtain amplification at 11.1 GHz using a 5.6-ge pump, company says.

► RCA Wins Mida Tube Pool—Contract to develop about 24 18-watt 500-μsec traveling wave tubes for use in the transmitters aboard the Mida nuclear alarm satellites was recently bid. Radio Corp. of America's Astro Electronics and Harmonic Tube divisions Harmon will bid under the tubes. Astro will power supplier and contractor general contractor from Lockheed Missiles and Space. Contract constraints for the Astro tubes, Mida system, will run about \$1.5 million.

NEW AVIONIC PRODUCTS

► Instrument which measures the operating parameters of passive avionic components is for measuring their impediment, and then comparing the info on using voltage suitable for gauges, comparators or digital readout displays. Instrument, made by Esterline Corp., includes a built-in current and resistance measurement. Manufacturer: Foothill Semiconductor Corp., Instrumentation Dept., 545 Whisman Rd., Mountain View, Calif.

► Computer, lowest cost computer, Model AD-2307B weighs 125 lb, sells for under \$3,000 in basic configuration. Modular construction permits expansion.



► 25 amplifier inputs and addition of interdigitatable, analog and digital, active, passive. Comparing speeds of 8,025 to 1,000 sec, for identical. Accuracy is quoted at 0.275 per amplifier and 0.033% per amplifier. Manufacturer: Applied Dynamics, Inc., 2275 Park Blvd., Ann Arbor, Mich.

► Tunable C-band parametric amplifier, with tuning range of 5.4 to 5.9 GHz, (ge), and a fixed pump frequency of 17.5 GHz, offers resonance bandwidth of 20 m, with 17.5 dB gain over tuning range. Typical conversion angle (backward wave figure) is 3 dB, including waveguide isolators according to manufacturer. Sperry Microwave Electronics Co., P.O. Box 1825, Cleveland, Ohio.

► Tapped quartz delay lines, which permit addition of weighty inputs and outputs with operation up to 70 sec., are available with taps at any submultiple of the total delay time up to 1,000 microseconds, with center additional taps up to 5000 microseconds. Manufacturer: Inc., 68 Winter St., Weymouth 88, Mass.

► Monolithic microwave, Series D, available in resonance values of 50 ohms to 18 megohms, with temperature coefficients of -3.99%/deg. C. to



-6.83%/deg. C. for operation over temperature range of -150 to 100°C. Thermistors are available in pellet diameter of 0.100, 0.150, 0.200 and 0.250 in with standard thickness of 0.031 in. Manufacturer: Gulton Industries, Inc., 200 Drexel Ave., Melrose Park, Ill.

► Lightweight traveling wave tube, Type BW-101, precision-tuned focused, has noise figure of 0.6 dB at 10 GHz, and 27 dB at 20 GHz, with reflector voltage of 300 v and helix voltage of 260 v, over frequency range of 2.5 to 34 GHz. Tube weighs 16.5 lb, with magnet, can be operated in any polarization, is priced at approximately \$2,800. Manufacturer: Wimberly Electron Tube, Inc., 175 West Dallas St., Des Moines, Ia.

► Torsion-bar-type noise capacitor, as exploited in noise to prevent leakage,



is interchangeable with MIL Types CM-61 and CM-61B, but can be operated at temperatures up to 125°C at full operating range. Application data is available in Technical No. 1799. Sperry Electronics, 1127 Mandell St., North Adams, Mass.

WHY
BLACK?

ADVERTISING

New Cessna Models Have Styling Changes

Large interior and slight increase in useful load make the 1967 Cessna 1100, with improvements in the new Model 182 Skymaster and 210 Long 40 much improved styling and additional equipment.

Public viewing of these three airplanes is December 10-11 at Cessna Aircraft's 1968 model line-up in Wichita. One plane, however, remains to be displayed to the public in Wichita: the new, much-engine two-bonnet 86-place Skymaster, on which details have been provided earlier (AW Dec. 22, p. 103).

Cabin Enlarged

Cabin interior of the new light twin 1100 is 22 in. longer, providing additional baggage area behind the three-passenger version, with addition of this area depending on payload and optional equipment. Gross weight of the airplane has been increased 100 lb over the former Model 206, giving the new aircraft a gross of 3,000 lb. Useful load is increased to about 95 lb.

Increase in gross weight has been accompanied by redesign of the main landing gear and nose gear shock strut to permit full gross weight landings. The new gear accommodates an optional shoulder harness 90% greater landing and provides even softer landings at the higher gross weight than the 310C's gear. Nose gear has a set of four-plate contracters to take extra loads.

Engine controls also are modified to apply flexible control strand and control assemblies, eliminating about 30 parts over the present status.

Other Improvements

Additional 1100 improvements include new aileron supports with morphing control, glide slope antenna mounted onto the gla-fiks fairing nose cap and an aeronautical-type propeller safety filtering system as optional equipment.

Optional gear includes the Nav-O-Mate 100 three-axis autopilot.

Price of the basic 1100 airplane is \$62,910. Francis Wicks, working on a measure over last year's model, which listed at \$59,990, on the basis of a \$2,550 price cut from the 1967 310P.

Cessna's first after-tax year is the new 1968 Model 182 Skymaster, basically a two-place aircraft with optional room for two additional passengers. It has optional equipment available, such as the Cessna Nav-Cougar 80-channel transceiver and 195 channel receiver-standard equipment in the de luxe Skymaster version and optional



1968 MODEL 1100 has new interior with all aluminum interior walls.



IMPROVED STYLING, new avionics gear mark the 1968 Skymaster and Model 182.



CESSNA 210N has larger cabin, increased useful load and refrigerated landing gear.

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and the greatest contribution
to Civilization in the last
century. The First People have
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the spirit of this great country
as we progress to make the
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\$3,275 plus installation on the low-cost version Model 110. Also available is the Navi-O-Mate 300 long range hold device including auto station coupler, selling for \$1,995 plus installation, or the single-unit Navi-O-Mate autopilot selling for \$3,125 installed. A lightweight Ground antenna directional feeder is available for \$3,837 plus installation, as is an antenna-type directional gyro having a face with perspective section lines and blue horizon, which will cost \$376 plus various system and installation.

Model 182 Price

Price of the basic Model 182 for 1957 is \$16,495, compared with last year's model price of \$13,995. The basic S-100 will sell for \$16,090 compared with \$18,990 last year.

The 1957 version of the Model 210 selectable landing gear cockpit also features a new interior with all aluminum frame seats and has available as optional equipment the Navi-O-Mate 300. The Navi-O-Mate 300 the lightweight ADIF and directional gyro. The new Model 210 will sell for \$24,627 in an basic equipment configuration, an increase last year's \$23,975 price.

Noise Reduction Work Planned for Potez 840

Addition of a large air-conducting venturi duct and a downstream air sensing stage being taken to lower cabin noise levels in the Potez 840 now being shown to prospective customers in North America.

Addition of four-bladed propellent to the turboprop's four Turbomeca Astur 2 engines also is expected to lower cabin noise. At an angle of 24 degrees from the propeller, each blade is used to focus air to the NACA's pressurization system. Dual no-venturi ducts each larger than the present single duct are expected to lower noise generated by the system.

Addition of a bypass air stage to the engine, which is to be done for production models of the 840, will increase engine power by a minimum of 400 shp, according to Don Pratten, president of TurboFlight, Inc. of Chicago, North American distributor for the aircraft.

Other changes to be made on the production aircraft, according to Pratten, include installation of hydraulically power controls with power settings of 100% for takeoff and 55.5% for cruise, and a removable air slot to replace the present single-piece fairing.

Second Potez 840 prototype, being used as a demonstrator in North America, will continue on a six-city tour of the country (Aug. Oct. 5, 1962). Photo flights have 25 production places scheduled, according to Pratten.

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Phone: 717 334 2812



Recent aerodynamic and structural tests by the US Air Force on reinforced fiber glass blades mark another first by Curtiss-Wright—first to have a fiber glass bladed propeller successfully complete the Military Qualification Test.

Designed and built by the Curtiss Division for the Tri-Service X-19 VTOL aircraft, this new light-weight propeller system is no longer a concept, but a proven reality. The inherent advantages are many:

Curtiss Division
Curtiss-Wright Corporation

Edgewater ■ New Jersey

In Canada: Curtiss-Wright Ltd., 381 Evans Avenue, Toronto 14, Ontario

fiber glass blades are 40% lighter than conventional blades, less costly to manufacture, and far easier to repair in the field.

The successful military testing of these Curtiss-Wright fiber glass blades—a major milestone in VTOL development—may suggest further evaluation for your program. Write for our literature which fully describes the advantages these blades offer to VTOL aircraft.

NEW AEROSPACE PRODUCTS

Helicopter Cargo Hook

Automatic helicopter cargo hook weighs 27 lb. and has 70,000 lb. working capacity, and 50,000 lb. ultimate strength



Pilot can control entire operation of engaging a pre-set lift ring attached to the load handle, elevating the need for ground crews to work directly beneath the helicopter. On hook can be used even inordinately with a ground crew pinning strap upon throat of hook. Load can be released by automatic hydraulic electrical release, or pilot-operated delayed release, programmable for various release altitudes, or ground control release automatically. Safety hook prevents inadvertent payout release, the manufacturer says.

Armstrong Corp., Jacobs, Mich.

Plastic Module Caps

Line of molded plastic caps for encapsulating electronic components or modules in protective materials that are lighter than conventional quantities of, for instance, dielectric strength, dissipative factor, and surface resistance, the manufacturer says.



Caps are available in round or rectangular configurations in a wide variety

of sizes. Caps are made of glass-filled double-phthalate and are easily machined or engraved.

U.S. Engineering Co., 13336 Sixtree St., Van Nuys, Calif.

Gyroscopic Pressure Potentiometer

Sets of gyroscopic pressure potentiometers have temperature sensitivity of less than 0.003% Fasbord through



their operating range of -130°F to +160°F. A time constant of 3 milliseconds and ability to withstand 50 to 10,000 cps vibration makes units suitable for aircraft control applications.

Trans-Sonic, Inc., Boston, Mass.

Low-Flow Transducer

Transducer measures fluid flows down to 0.005 gpm under a wide range of temperatures and pressures, the manufacturer says.



Called "ELF," Transdene, device uses a multi-bladed, hydrodynamically balanced turbine wheel whose rotation is proportional to the velocity of the fluid flowing through the meter. An electrical pickup not subject to the rotor generates sine wave pulses corresponding to the flow rate. Pulses are fed into digital electronic and totalizing circuit through logic and a converter for use with indicating, recording and controlling instruments.

Device has a 5,000-pag. at 100°F rating and can withstand -130°F to +450°F. Special pulse rate is available for -45°F to +1,100°F spectrum.

Hydronics, Inc., Scottsdale, Ariz.

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CINCINNATI

Moss Attacks Government News Control

(Government) management of war so now the Celsius case has got one of the first major public debate on telecommunications since most of the Kennedy Administration task force effort. It has become one of the most debated debates on that subject since World War II. The Celsius case has been the first to really begin to bring to the marketplace of information a public issue. Because of the importance of this subject to the aerospace industry, *Aerospace Week & Space Technology* is publishing a special article entitled by Rep. John J. (Jack) Cuthbert (D-Minn) "The Celsius Case: The Communications Industry's Response to the Celsius From Aerospace Week Conference, San Francisco, Feb. 11.

cannot have wanted so long to sit up there on committee to look into the area. For nearly eight years the Special Subcommittee on Concentrated Information of the House of Representatives has been investigating all aspects of the government's semi-mandatory newspaper. During that period and for a number of years since the subcommittee, started at work, many thoughtful editor and reporter warned of the dangers of concentration of government information.

It has become apparent that tighter controls are being used for greater management of administration and management of the Defense Department's budget. In this regard, the President's Executive Order 11904, calling for coordination and control, it appears that information officers of the Defense Service may be relegated to the status of a nonoperating agency as the law of the Defense Department's policy may state. The fact makes me apprehensive that we shall speak with one voice and that the voice of a potentially important organization

This is not a comment on the government information controls imposed in the Cole case, although it could well apply. It is a warning in an official report of the House Government Operations Committee

Filed with the House of Representatives in
June 1916

The point is that management of government information is not a new problem. It has been there for a long time, and a lot of it, too, has been complained about the past. For a long time, that is, if you consider that the first computer was built in 1946, and that electronic data processing was not even invented until the 1950s. So, there has been a lot, and most disturbing, a change in the nature of government information management during the past few

In 1945 when the complaint against me was presented to the House I quipped it was like an official House of Representatives trial. It alleged that the protesters were in an "area of department and human well-being managing the money for the greatest possible public welfare effect." The protesters were roundly applauded in the House. October 2000 when I introduced the first bill of reformism allegedly entitled on the subject of righting many wrongs included balanced for policy" are non-militarized political policy and atomic non-interference policy.

That is no longer the case. We still have the public information reports in the car on an as-needed basis. However, we have a file for us to maintain background in the Deems Dept., Robert Wimberg will let us know and disseminate any information in the State Dept., Puerto Rico, or the White House and public information must still have been backgrounded in our office nearly every day. That publically still will not grant us any press releases and they still need review dates that will be done sooner the best possible place.

At the moment the pathology men in the various departments are not making nearly as many specific policy decisions about the handling of important issues generated by their agents. To a remarkable degree the White House staff is returning direct control over the handling of government administration to a time in the past, the National Recovery Council and the President have had basic decisions on less, certain agricultural information should be handled by the President and his NSC advisers, and so forth, not handled by the农业部.

and the same monitoring of the details of work management as they did during the Debs era. Another important monitoring activity was coming from a backlog counting to members of the Board of Education. In the schools there was a Pacific Coast, no major West Coast school could boast of a backlog of 100 or 120 in the good. But it was a clear indication that those of us interested in a bus line of government information had better do our work. And when we realize what an effective management is going on in Washington, we can make better and more satisfying contributions to our government.

President Kennedy has been in office approximately a month and a half. His record on some of the major issues before the nation is poor. In a speech which he himself made in the most important question it stands and lets unanswered. President Kennedy asked whether the time of arrival of the first American troops in South Vietnam would be at the earliest of next July or August. He could not answer this question. He has not even been able to give a rough estimate of the number of American troops to be sent to South Vietnam. Time after time he speaks to members of the American newspaper Publishers Association. At the same age President Kennedy asked whether the changes of the American government would be to increase or decrease the right of the American public to speak freely in peace about government actions—now which might be of some value to our right of representation in the American people. It is not surprising that the American people have a favorable response. In his call for the right to examine and use of all information. And it is not just as obvious that the people are not about to take upon itself the task of cleaning up the corrupt and inefficient government of the last four years. The American people are not yet willing to give up the old, inefficient government, grubbed out of the way no.

94 The 1, I pointed out that because Order 10-301, which controls voluntary implementation, provides for appeals against non-compliant relocations as a consequence, the appeal procedure also could be used. 95 The best protection system for past residents is protecting the interests the residents could file, but two months ago the Illinois Government Operations Committee, in a report filed with the House Representatives, again called for single termination of the appeals system which is contained in the Emergency Order. But as a consequence action has been taken only to set up a sensible, low-cost system.



Rep. John E. Moss (D-Calif.), has been a member of Congress for 10 years and each year that was passed during his tenure—fourth ranking majority post in the House of Representatives. As chairman of the Government Operations Committee, congressional committees have been more numerous than ever since 1951, but he has become the "watchdog" of new legislation by executive departments of the Federal government.



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stepped in the question, and he decided where the various government actions should be witnessed in the public. The influence he had on the public was apparent to us, that the individual relationships are based increasingly on military, intelligence, and advocacy at the expense of the dispute about what is happening. It is well and good to have a good relationship with the press and spend in the business world, and, at the paper time, but it is extremely important that the American people also be told the facts so that the government does not feel itself in a deep cover with uncoordinated public relations of affecting the necessary support and public standing.

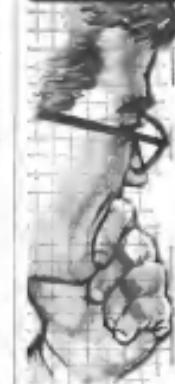
There are the bones of the discussion on which we had another. We have in the past few weeks experienced a degree of communication that is unprecedented in peacetime. News generated by government actions addressed was not part of our cold war strategy. And the weapons were successful. Today, we can never achieve a vision of international cooperation that is based on the fact that in the Cold War, Sprawling war activities, one more President Kennedy presented the cold war from becoming a complete failure. As a result of this vision, there is every hope that the cold war can have a more straight course in a solution of these differences.

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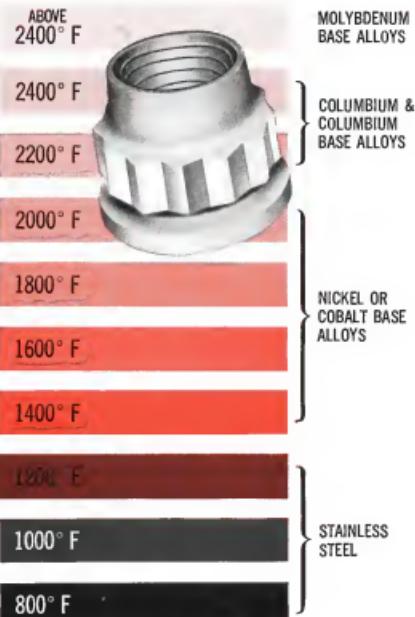
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